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Jürgen K. Zattler\*

# Growth Policies in Developing Countries

## A Transaction Cost Perspective

*Long-term growth in most developing countries is driven by the adaptation of technology from developed countries. The question, however, of how to promote technology adaptation is a difficult one. The following article introduces a transaction cost perspective and applies it to the concrete and – against the background of the 4th Ministerial Conference of the WTO in November 2001 – topical question: how do WTO rules impact on development in terms of technology adaptation? This issue is of utmost importance to the EU, which put forward the argument that the new Trade Round had to become a “Development Round”.*

The essential role of knowledge in explaining growth has been widely acknowledged. This is a consequence both of the technological revolution of the last twenty years<sup>1</sup> and of the power of conviction of the new growth theories. In the new growth models, “technology” or “knowledge” is an important factor in explaining growth. However, those models concentrate on the question of how to explain growth processes in general; very few models focus on the specific situation of developing countries.

For their growth process, developing countries do not essentially rely on knowledge created by themselves.<sup>2</sup> These countries must therefore import the relevant technology. However, it must be assumed that this imported technology, having been developed for use in a substantially different environment, cannot be transferred to developing countries entirely without a loss in productivity.

Empirical studies have shown clearly that the enormous international differences in production output per worker can only partly be explained by the difference in the size of the factor inputs (human and physical capital).<sup>3</sup> The residual quantity that is not attributable to the difference in the size of capital inputs is explained by differences in productivity. If there did not exist differences in productivities between countries, the output per worker in the 5 richest countries would not be – as virtually measured – 32 times higher than in the 5 poorest countries, but only 4 times as high.<sup>4</sup> This demonstrates that technology is not an internationally “free good” to which all countries have equal access. The large

productivity gaps internationally must be connected with the way knowledge and technology are adapted across borders.

The knowledge relevant to the adaptation of technology is to a large extent uncoded or “tacit” (not accessible e.g. in the form of books or licences). The tacitness of knowledge is one reason why the transfer of technological products over long distances and between different cultures is beset with difficulties and incurs costs. The “tacit” aspect of technology refers to local capabilities to handle technology and knowledge. The efficient application of technology and its transfer require local capabilities and/or uncoded knowledge relating to specific products, production processes, companies and markets. On account of the uncoded component of technology, productivity gains cannot be achieved automatically by purchasing modern capital goods, technology blueprints or formally more highly qualified workers. Foreign technology must be adapted to local conditions.

As the full adaptation of technology takes place gradually it involves learning effects. The learning effects relate in the first instance to experience in the

<sup>1</sup> The share of knowledge-intensive goods in total world trade increased between 1980 and 1994 from 12 to 24 per cent. Foreign direct investment also increased substantially, with a large share of high-technology capital goods. Cf. K. Liebig: *Geistige Eigentumsrechte: Motor oder Bremse wirtschaftlicher Entwicklung?*, DIE, Bonn 2001, p. 12.

<sup>2</sup> The share of developing countries in global expenditure on R&D is only about 4 per cent. Cf. K. Liebig, *op. cit.*, p. 12.

<sup>3</sup> The variations in output per worker are extremely large. Cf. R. E. Hall and C. I. Jones: *Why do Some Countries Produce so Much More Output per Worker than Others?*, in: *Quarterly Journal of Economics*, Vol. CXIV 1999, p.83.

<sup>4</sup> *Ibid.*, p. 92.

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production process. Local capabilities can only be acquired by trial and error and by experience gained in the local context. Technology adaptations are driven as a rule by the application of existing technology in the local context. Also innovations are closely linked to the application of existing technology in specific local conditions ("adaptive innovation").<sup>5</sup> Technological knowledge is transferred and formed to a large degree through contact between suppliers and buyers.<sup>6</sup> Through supplier-buyer relationships learning processes can be set in train and productivity raised.<sup>7</sup> Mutual learning effects mean that close cooperation brings benefits for both partners.<sup>8</sup> The rise in productivity may take place as a result of better use being made of existing factor inputs or of using improved inputs.<sup>9</sup>

If an enterprise invests in a project associated with learning, and the project fails, then the learning that had been generated up to this point is lost. Therefore, the cost of learning can be considered as "sunk costs".<sup>10</sup> Sunk costs lead to "path dependency"<sup>11</sup> if the investments associated with learning are complementary to each other. Technological knowledge is "cumulative" and "path dependent". Technological development is always embedded in the existing technological regime. Companies decide on technological projects that are compatible with existing skills and markets as well as past investments. They focus on improving known production processes and products that have been successful in the past. This has been called "localised learning".<sup>12</sup> Taking into consideration the existing situation, e.g. human skills, technology and institutions, companies maximise learning and minimise the costs of technology adaptation and also transaction costs.

It is well known that, in the case of the learning process, welfare can be improved by government intervention. With regard to learning in the area of technology adaptation, the government can foster income by granting subsidies for economic activities relevant to human resource development and to specific key industries, or by making available an efficient infrastructure relevant to technology adaptation (transport, communications, the setting of norms and quality control etc.) Also, where existing trade distortions make it difficult for importers to access foreign technology (import taxes, quotas and non-tariff barriers), the government should dismantle those obstacles.

However, those policy conclusions are unsatisfying because of their general nature; for policy-makers they are not specific enough. As an example, the

advice to promote human resource development still leaves the crucial question open, namely what kind of activities should be promoted: primary, secondary or university education, professional training, learning on the job, technical knowledge or languages?

Transaction cost economics has thrown light on many new aspects of a series of economic issues. In terms of policy recommendations, this approach stresses the importance of an appropriate and well-defined legal framework for economic activity. The question here is whether this approach can be applied to the specific issue of technology adaptation and whether policy recommendations can be identified that are valuable for policy-makers. The transaction cost approach and, in particular, the property rights theory emphasise that market failure is, in principle, overcome by the cooperation of private actors. This would also apply to the case of learning in the area of technology adaptation. However, private actors do not internalise market failure in every case. The limits to private cooperation will be shown in the following section, thus laying the ground for the identification of government action.

<sup>5</sup> Cf. B. A. Lundvall: Innovation as an Interactive Process: from User-Producer Interaction to the National System of Innovation, in: G. Dosi et al. (eds.): *Technical Change and Economic Theory*, London and New York 1988, p. 350ff. For a survey of studies that demonstrate empirically the process of "adaptive innovation", cf. J. M. Katz: Introduction, in: J. M. Katz (ed.): *Technology Generation in Latin American Manufacturing Industries*, London 1987.

<sup>6</sup> Cf. e.g. M. Bell: *Technical Change in Infant Industries. A Review of Empirical Evidence*, The World Bank, Washington D.C. 1986, p. 92. Many studies indicate that the capabilities relevant to technology adaptation are acquired in close contact with foreign partners. Cf. P. M. Romer: *Two Strategies for Economic Development: Using Ideas and Producing Ideas*, Proceedings of the World Bank Annual Conference on Development Economics 1992, Washington D.C. 1992, p. 65ff. with regard to Mauritius.

<sup>7</sup> Cf. ILO/UNCTC: *Economic and Social Effects of Multinational Enterprises in Export Processing Zones*, International Labour Office, Geneva 1998; M.-L. Egan and A. Mody: *Buyer-Seller Links in Export Development*, in: *World Development*, Vol. 20, No. 3, March 1992; B. A. Lundvall, op. cit.; E. v. Hippel: *The Sources of Innovation*, Oxford University Press, Oxford und New York 1988.

<sup>8</sup> Cf. H. Pack: *Endogenous Growth Theory: Intellectual Appeal and Empirical Shortcomings*, in: *Journal of Economic Perspectives*, Vol. 8, No. 1, 1994, p. 7; F. Stewart and E. Ghani: *How Significant Are Externalities for Development?*, in: *World Development*, Vol. 19, No. 6, 1991, p. 574f., and cited literature.

<sup>9</sup> Cf. F. Malerba: *Learning by Firms and Incremental Technical Change*, in: *The Economic Journal*, Vol. 102, July 1992, p. 848.

<sup>10</sup> Cf. W. J. Baumol: *Indivisibilities*, in: J. Eatwell, M. Lmligate, P. Newman (eds.): *The New Palgrave*, Vol. 2, London 1987, on the concept of "sunk costs".

<sup>11</sup> "Path dependency" means that the "...events of the earlier periods dominate the further development of the system, as well as the system itself becomes more and more locked in." Cf. A. Balman et al.: *Path-Dependence Without Increasing Returns to Scale and Network Externalities*, in: *Journal of Economic Behavior and Organization*, Vol. 29, 1996, p. 161.

<sup>12</sup> Cf. A. B. Atkinson and J. E. Stiglitz: *A New View of Technological Change*, in: *Economic Journal*, Vol. 79, September 1969.

### Conditions for Private Sector Cooperation

External effects and other market distortions have been the subject of intense discussion, in particular with reference to property rights theory and non-cooperative game theory. The “Coase Theorem” is founded on a differentiation between the physical good and the property right with regard to this good. This differentiation allows external effects to be redefined as the right of a person to act in a way which is harmful to third parties (negative external effect). As rights are tradable and economic actors strive to maximise their benefit – the “Coase Theorem” states – the external effect will be internalised by negotiation.

However, this internalisation incurs costs if the market is not frictionless. The existence of market frictions means that the internalisation of harmful effects will not be effected by private institutions without costs (“transaction costs”). In particular, the problem arises of determining the degree of compensation between the parties. This problem is relatively easy to resolve if there is symmetrical information between the transaction partners. The problem is more difficult if asymmetrical information exists; this situation gives rise to “moral hazard” and “adverse selection”.

The property rights theorists have tried to show that a “limited pareto-optimal” situation is engendered by institutional transaction arrangements at the private-sector level. This would mean that, because of the unobservability of transaction-related information, the ideal situation is not achieved in welfare terms; but if the information problems relating to unobservability are included, private actors would secure the best transaction arrangements possible in these circumstances.<sup>13</sup>

The concept of the private-sector resolution of external effects has a number of weaknesses which have been highlighted in particular by advocates of non-cooperative game theory. These weaknesses also call into question a – in terms of welfare economics – limited pareto-optimal solution of the problem of external effects at the private-sector level. It has been shown that the relatively most favourable arrangement in terms of welfare economics is not the one that prevails in all cases. Finite repetition of the “game” cannot resolve the incentive problem – by achieving (limited) pareto efficiency. A cooperative deal between two potential transaction partners (principal and agent) – irrespective of how high the costs of setting up a transaction arrangement are in

relation to its potential benefits for the participants – does not always come about.<sup>14</sup> And so it can no longer be assumed that transactors create transaction cost minimising institutions in every case.<sup>15</sup>

The question as to whether institutional transaction arrangements are created by private actors depends on how great the potential for strategic behaviour between the transaction partners is in each case. The degree of strategic and/or opportunistic behaviour is determined by the endogenous characteristics of transactions and by (external) uncertainty.

### Endogenous Factors

Efficient solutions within a non-cooperative system assume that the players go through cooperative negotiating steps.<sup>16</sup> The cooperation mode is therefore decisive for the outcome of the negotiation process, i.e. on the one hand for how the benefits deriving from the transaction are divided between the two partners and, on the other, whether a transaction comes about at all. If preliminary negotiations take place in which the rules are defined, it is possible to ensure that the further negotiations take place cooperatively. The outcome of the negotiating process therefore depends largely on whether and in what form preliminary negotiations on the cooperation mode take place.<sup>17</sup>

The efficiency of negotiations also depends on the extent to which participants are able to communicate and enter into binding commitments. The scope for “credible commitments” increases the more often the “game” is repeated.<sup>18</sup> It has been shown that a private-sector solution becomes more probable with the repetition of “games”.<sup>19</sup> “Repeated games” enable

<sup>13</sup> Cf. Y. Barzel: Transaction Costs: Are They Just Costs?, in: *Journal of Institutional and Theoretical Economics*, Vol. 141, No. 1, 1985, p.10.

<sup>14</sup> Cf. E. Terberger: Neo-institutionalistische Ansätze. Entstehung und Wandel – Anspruch und Wirklichkeit, unpublished manuscript, Wiesbaden 1992, p. 237ff.

<sup>15</sup> Ibid., p. 246f. For a fuller account cf. also R. B. Myerson and M. A. Satterthwaite: Efficient Mechanisms for Bilateral Trading, in: *Journal of Economic Theory*, Vol. 29, 1983; W. Samuelson: A Comment on the Coase Theorem, in: A. E. Roth (ed.), *Game-Theoretic Models of Bargaining*, Cambridge 1985.

<sup>16</sup> Cf. J. F. Nash: Two-Person Cooperative Games, in: *Econometrica*, Vol. 21, 1953; K. J. Arrow: The Property Rights Doctrine and Demand Revelation Under Incomplete Information, in: M. Boskin (ed.): *Economics and Human Welfare*, New York 1979.

<sup>17</sup> Cf. E. Terberger, op. cit., p. 85.

<sup>18</sup> Cf. J. Tirole: Collusion and the Theory of Organizations, in: J.-J. Laffont (ed.): *Advances in Economic Theory: Proceedings of the Sixth World Congress of the Econometric Society*, Vol. 2, Cambridge University Press, Cambridge (MA) 1992; D. Aamoglu: Monitoring and Collusion, Mimeo, Massachusetts Institute of Technology, 1994, on the repeated transaction models.

participants to gather information about their respective transaction partners. The chances of private sector cooperation are improved by the promotion of repeated games. This point will be returned to later.

The high fixed costs of setting up transaction arrangements are another factor impeding negotiated solutions. The fixed costs of transaction arrangements accrue irrespective of the commercial value.<sup>20</sup> Once the fixed costs of setting up transaction arrangements have been paid, they take on the character of sunk costs. The strategic behaviour problem is exacerbated by these high fixed or sunk costs.

### Uncertainty

Moreover, transaction arrangements are less likely to come about if the negotiating relationship between two transaction partners – principal and agent in property rights terminology – is under strain from uncertainty factors exogenous to the relationship. In this case the contribution of transactors that trigger external or “harmful” effects is difficult to observe or measure.<sup>21</sup> In general, exogenous uncertainty factors increase the risk associated with binding contracts. A modification of the contractual arrangements considered necessary by one transaction partner and caused by external factors is associated with incalculable additional costs.<sup>22</sup>

### Transaction Attributes and Governance Structures

We shall now look at a way of determining the economic policy implications of the growth process in developing countries, taking into account the crucial role of the above (exogenous and endogenous) conditions for private sector cooperation. Williamson's concept of the various structures of private-sector cooperation represents a useful point of departure.

Williamson tried to establish a systematic link between the characteristics of transactions (transaction attributes), the resulting coordination requirements and the appropriate “governance structures” or institutional arrangements.<sup>23</sup>

He defines three transaction attributes:

- the frequency with which transactions are repeated,
- the uncertainty associated with a transaction, and
- the extent to which a transaction necessitates long-term transaction-specific investments.

Transactions can be performed within different governance structures. A certain governance

structure will prove efficient depending on the attributes of a given transaction:

- Cooperation through the market (“market governance”) for non-specific standardised transactions. Market governance takes place through classical contract law.
- Transaction-specific governance for repeated transactions requiring high or very high transaction-specific investments (especially if they take place in an uncertain environment). These include companies in particular.
- Trilateral governance for occasional transactions requiring relatively high or very high transaction-specific investments. Transaction-specific governance structures are not suitable in this case because the costs of transaction-specific structures and/or institutions for occasional transactions only are relatively high; secondly, market governance structures are not suitable because the owner of the value-dependent resource could not insure against the risk of the resource being devalued by the actions of the transaction partner. This is particularly true in an uncertain environment. The framework conditions relating to the contract cannot therefore be foreseen for the full term of the contract (“planning gaps”).<sup>24</sup>

Williamson's concept allows the identification of the benefits of the various governance structures depending on transaction attributes. The categories used by Williamson can be applied to the growth process in developing countries. For one thing, the general level of uncertainty in developing countries is extremely high; for another, transactions in the sphere of technology adaptation are not, as a rule, standardised or uniform: as we have seen above, technology adaptation takes place in small iterative steps, each building on the experience of the preceding step. Finally, investments in technology

<sup>19</sup> Cf. D. C. North: *Institutions, Institutional Change and Economic Performance*, Cambridge 1990, p. 13; Y. Barzel, *op. cit.*, p. 471.

<sup>20</sup> Cf. C. J. Dahlman: *The Problem of Externality*, in: *The Journal of Law and Economics*, Vol. 22, 1979, p. 146.

<sup>21</sup> Cf. G. Bamberg and K. Spremann: *Agency Theory, Information, and Incentives*, Berlin 1989, p. 24.

<sup>22</sup> Cf. O. E. Williamson: *The Economics of Governance: Framework and Implications*, in: *Journal for Institutional and Theoretical Economics (JITE)*, Vol. 140, No. 1, 1984, p. 205.

<sup>23</sup> Cf. O. E. Williamson: *Transaction-Cost Economics: the Governance of Contractual Relations*, in: *Journal of Law and Economics*, Vol. 22, No. 2, 1979; O. E. Williamson: *A Comparison of Alternative Approaches to Economic Organization*, in: *Journal of Institutional and Theoretical Economics (JITE)*, Vol. 146, 1990.

<sup>24</sup> Cf. O. E. Williamson: *Transaction-Cost Economics ...*, *op. cit.*, p. 237.

adaptation are highly transaction-specific: the value of the investments depends essentially on the transaction relationship in each case and this applies to investments in both human capital and physical capital. The mutual learning processes between domestic suppliers of intermediate products and their buyers assume that both sides are making transaction-specific investments in physical and human capital. The same applies to the relationship between the foreign supplier and the domestic producers: the value of the investment of the domestic adapters depends on whether the relationship with the foreign supplier is sustained over a fairly long period of time; only then can the domestic company acquire the foreign technology. On account of the high transaction specificity, actors operating in the field of technology adaptation will have to create institutional transaction arrangements that ensure that their resources can be exploited in the longer term. Hence, technology adaptation is above all about transaction-specific investments which are made in a very uncertain environment and not often repeated in a similar form. We can conclude from this that trilateral governance is suitable for investments in the sphere of technology adaptation.

Even though the transaction attributes introduced by Williamson – “transaction specificity”, “uncertainty” and “frequency” – can be applied to the process of technology adaptation, it should be pointed out that the enquiry behind his approach is limited. Williamson merely examines which governance structures are best suited to which transaction

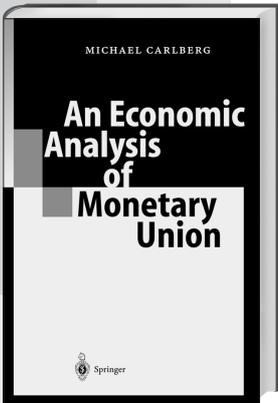
types. The approach does not set out to derive implications for economic policy: one could, for example, examine how welfare gains could be achieved by exerting public influence on the transaction attributes.

In the following Williamson’s concept will be combined with the conditions for private sector cooperation. This will allow the aforementioned shortcomings in Williamson’s concept to be overcome and conclusions for economic policy to be drawn.

The above allows two ways to be inferred in which the government can improve the conditions for private sector cooperation in the case of market failure. As already analysed, the potential for strategic behaviour depends on the endogenous characteristics of transactions and on exogenous factors. Economic growth is promoted by lowering those transaction barriers relevant to technology adaptation. In particular, economic policy is capable of fostering technology adaptation and growth by influencing the transaction attribute “frequency” and by reducing uncertainty.

#### Influencing the Transaction Attribute “Frequency”

The frequency with which transactions are repeated within the same transaction arrangement is connected on the one hand with the length of the cooperation arrangement. And the frequency of transactions within a transaction arrangement depends in turn on how long-term the transaction arrangement is designed to be. A long-term cooperation transaction increases the chances of internalisation. As a number of authors have shown, a cooperation arrangement



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designed for the long term can reduce information and incentive problems.<sup>25</sup> It is thus possible to increase the number of transactions within a cooperation arrangement. Repeated games make the threat of negative sanctions more credible (“credible commitments”) and increase the partners’ incentive to cooperate. Conversely, it may be worthwhile for the transaction partners to honour their commitments in order to establish a good reputation. The probability of cooperative solutions is therefore positively influenced by the length of the cooperation arrangement.

The frequency of repeated transactions, on the other hand, is connected with the number of participants. The potential for strategic behaviour is greater, the more transactors are involved. By limiting the number of participants it is easier to learn about the performance and preferences of the other participants. Interaction between the transaction partners can be intensified if firm cooperation relationships are established between a limited number of participants.

The government can promote investments in the field of technology adaptation by encouraging repeated games and thus helping to reduce the potential for opportunistic behaviour. The above-mentioned parameters, “length of cooperation arrangements” and “number of participants” constitute the starting-points for encouraging repeated games. If there is the possibility of repeated transactions, trilateral governance becomes beneficial. Production within a firm can then be outsourced and organised within trilateral governance structures.

Trilateral governance is common in the area of local adaptation of foreign technology. These mixed governance forms have the advantage that opportunism and uncertainty are reduced by the long-term nature of a transaction arrangement and by personal relationships among a limited number of participants. Yet, on the other hand, the productivity advantages of a specialised division of labour can be used.

The government can encourage trilateral governance structures between local technology-adapting companies and institutions or close cooperation between domestic and foreign companies in different ways. It can, for instance, offer technology-related information (for example, technical advisory and information services, public quality control) and encourage the exchange of information by making available the necessary physical infrastructure and the institutional and legal framework (corporation law, contract law, bankruptcy law etc.) In addition, state institutions can

take an active part in the coordination of information and decisions.<sup>26</sup>

Government bodies can achieve similar effects by promoting local agglomerations. For countries with weak public finances, comprehensive promotion policies, such as public provision of infrastructure, are not viable as a rule. By promoting local agglomerations scarce funds can be put to relatively targeted use. Locally concentrated business parks often form the basis of symbiotic organisations. The government can facilitate the local concentration of economic structures with the appropriate legal regulations and the provision of infrastructure, for example development zones, technology parks, and industrial districts or industrial clusters.

### Reducing Uncertainty

The question of which governance structure has the lowest transaction costs cannot be answered in general but depends on the transaction attributes in each case. The greater the transaction specificity of investments and the degree of external uncertainty, the higher the transaction costs. This applies to all governance structures, though trilateral organisational forms and companies become more (transaction-) cost-effective as transaction specificity (and uncertainty) rise (cf. the continuous lines in Figure 1).<sup>27</sup> Whereas in section (a) the market displays the lowest transaction costs, in the middle area (section (b)) trilateral governance structures are the most favourable and for high transaction specificity (or uncertainty) it is companies (section (c)).

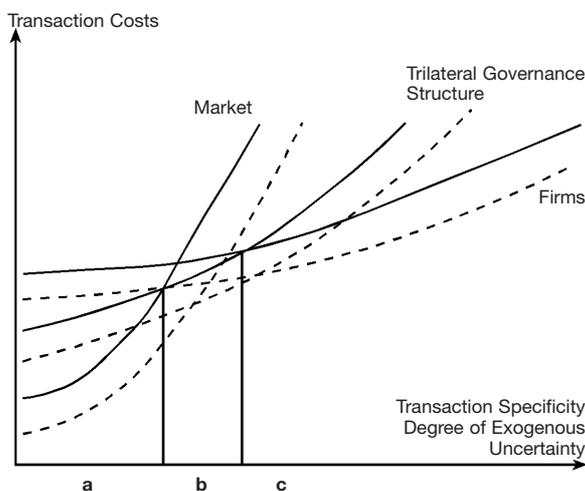
For transaction-specific investments the transaction costs associated with external procurement are relatively high since the opportunistic behaviour of the

<sup>25</sup> Cf. B. Klein, R. Crawford, A. Alchian: Vertical Integration, Appropriable Rents, and the Competitive Contracting Process, in: *Journal of Law and Economics*, Vol. 21, 1978; E. Radner: Repeated Principal-Agent Games with Discounting, in: *Econometrica*, Vol. 53, 1985.

<sup>26</sup> On the question of state promotion of trilateral governance structures and networks cf. especially J. Humphrey and H. Schmitz: The Triple C Approach to Local Industrial Policy, in: *World Development*, Vol. 24, No. 12, 1996; L. Nadvi: The Cutting Edge: Collective Efficiency and International Competitiveness in Pakistan, in: IDS Discussion Paper, Institute for Development Studies, No. 360, 1997; H. Schmitz: Collective Efficiency: Growth Path for Small-Scale Industry, in: *The Journal of Development Studies*, Vol. 31, No. 4, 1995; J. Tendler and M. Amorim: Small Firms and their Helpers: Lessons in Demand, in: *World Development*, Vol. 24, No. 3, 1996.

<sup>27</sup> The graph is based on a diagram by A. Picot: Contingencies for the Emergence of Efficient Symbiotic Arrangements, in: *Journal of Institutional and Theoretical Economics (JITE)*, Vol. 149, No. 9, 1993, p. 733.

**Figure 1**  
**Transaction Costs Driven by Transaction Specificity and Exogenous Uncertainty**



transaction partners must be limited by monitoring and controlling the contractual relationship. These costs can be reduced, but the consequence would be an increase in the opportunism of the contract partners.<sup>28</sup> Transaction costs and opportunism can however be reduced at the same time by transferring the transactions concerned to another more integrative governance structure.

On account of the opportunism problem, transaction-specific investments are unlikely to come about through the market. Opportunism on the part of the contracting parties is a particular problem when external uncertainty factors are very pronounced. High external uncertainty means that contractual relationships must be adapted more frequently. Conversely, market relationships become more efficient compared with integrative governance structures as the importance of external uncertainty factors diminishes. Companies will then transfer transaction-specific activities to another place, i.e. procure the respective outputs through the market or through trilateral governance structures. The curves in Figure 1 move down (broken lines).

But in order to compare the efficiency of governance structures it is not enough to consider their respective implications in terms of transaction costs. It is the total costs, made up of business production and transaction costs, that are decisive for business decisions. If we ignore the existence of transaction costs, it is more cost-effective to procure intermediate inputs externally than to produce them within the

economic unit. The main reason for this is that external procurement facilitates specialisation.

From a company point of view, production costs can therefore be reduced by specialising more. The result however becomes more differentiated if one takes into account transaction costs. Transaction costs rise, where transaction-specific investments are concerned. An individual company will perform an activity in-house as long as the productivity and cost advantages of external procurement do not exceed the additional transaction costs. If it were to specialise beyond this point the saving in production costs would be more than offset by the rise in transaction costs.

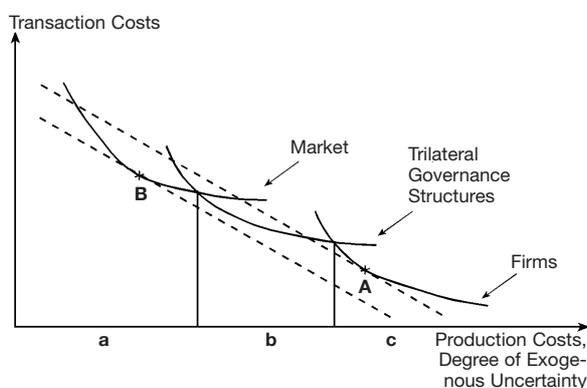
The optimum degree of economic specialisation depends on the level of transaction costs for market transactions. The market structure is the result ultimately of an optimisation analysis on the part of the demanders, since they consider the information costs and uncertainty in relation to the better product quality and productivity gains achievable through market relationships. Since in less developed countries the risks and transaction costs associated with trade through the market are high, a relatively wide range of outputs is produced within companies. North in particular has shown how, in the historical process, interdependencies between individuals become stronger so that, in order to make use of trade advantages, ever more complex institutional structures become necessary.<sup>29</sup>

The question now is how the transition from the one situation to the other can be achieved. Specialisation and associated productivity gains only come about if it is possible to limit the potential rise in the transaction costs of the market. In a dynamic survey, an economy can achieve welfare gains if the relative transaction costs (relative to the transaction value) are reduced by creating appropriate social institutions. This goes hand in hand with market differentiation and specialisation or greater division of labour, leading to higher productivity.

<sup>28</sup> There is a tension between transaction costs and the potential for strategic behaviour. "Economising on transaction costs essentially reduces to economising on bounded rationality while simultaneously safeguarding the transactions in question against the hazards of opportunism. Holding the governance structure constant, these two objectives are in tension, since a reduction in one commonly results in an increase in the other". (Cf. O. E. Williamson: *Transaction-Cost Economics ...*, op. cit., p. 245 f.)

<sup>29</sup> Cf. W. Elsner: *Institutionen und ökonomische Institutionentheorie – Begriffe, Fragestellungen, theoriegeschichtliche Ansätze*, in: *Wirtschaftswissenschaftliches Studium*, Vol. 1, 1987.

**Figure 2**  
**Transaction-specific Investments**  
**The Effect of Reducing Exogenous Uncertainty**  
**on the Production and Transaction Costs**  
**of Market Transactions**



This is illustrated in Figure 2. The graph shows the cost curves for outputs provided through the market, trilateral governance structures and companies for different degrees of uncertainty, as well as the breakdown of costs (transaction and production costs). As already explained, the cost curve for transaction-specific, non-standardised investments in a highly uncertain environment is lower for more integrative governance structures (especially companies). In a highly uncertain environment many transaction-specific investments tend to be carried out within companies. The market becomes more attractive and cost-effective as the degree of external uncertainty diminishes. This facilitates a shift from Point A to Point B. At this point production costs and total costs are lower than at the outset. This is made clear by the tangent which is closer to zero. The rise in transaction costs is more than offset by the reduction in production costs. Institutions that reduce uncertainty therefore give rise to additional transaction-specific investments, and intermediate inputs are no longer generated within companies but through the marketplace.

Here the question arises as to the decisive uncertainty factors for investments in the field of technology adaptation. Alongside natural catastrophes, social conflict, political instability and the limited scope for enforcing contracts in law, it is the macroeconomic situation that contributes to the instability of conditions in developing countries.<sup>30</sup> The reliability of price forecasts declines if the general conditions underlying economic activity are changing rapidly. Thus, policy must aim at reducing those instability factors.

The approach developed here will now be applied to a concrete area: how do the WTO agreements change the conditions for technology adaptation?

#### Impact of WTO Rules on Technology Adaptation

With the WTO Agreements concluded under the Uruguay Round and the prospect of a new round of trade negotiations, the network of multilateral regulations governing trade-related policies becomes ever denser. Two areas of regulations can be distinguished: trade policy (especially goods tariffs, services and non-tariff measures) and trade-related domestic policies (such as investment policy, policies for the protection of intellectual property rights, government procurement, technical, environmental and health standards as well as competition policy). The WTO is moving more and more towards regulations in the latter area. One driving force behind this evolution is the European Union. In the preparations for the 4th Ministerial Meeting of the WTO and at the conference itself, the EU was pushing with some success for an enlarged agenda for a new round of trade negotiations. The Doha Conference decided to take up negotiations on some environment-related WTO issues (in particular the relationship between WTO rules and multilateral environmental agreements) and that the next ministerial conference will decide on the initiation of negotiations on investment and competition rules as well as public procurement.

As analysed above, technological advances in most developing countries consist mainly of adapting the technologies of more advanced countries. How, then, do WTO regulations impact on technology adaptation? It must be assumed that WTO rules have an ambiguous impact on technology adaptation. On the one hand, they might facilitate technology adaptation e.g. by lowering the taxes on imported technology and by setting clear rules, thus reducing transaction costs. On the other hand, WTO agreements may make it more difficult for developing countries to apply policies which in the past have been used by some emerging economies to promote their technological development, e.g. the protection and promotion of specific industries through trade policy, export and export-related subsidies; the promotion of linkages by investment performance requirements, in particular referring to local content; the promotion of new national industries by means of lax or non-existent intellectual property rights.

<sup>30</sup> Cf. J. K. Zattler: *Endogenes Wachstum, Unsicherheit und Institutionen – wirtschaftspolitische Implikationen für Entwicklungsländer*, University of Giessen 2000, p. 77ff.

**Figure 3**  
**Impact of WTO Regulations on Technology**  
**Adaptation**

Areas of Regulation and Impact Level

	Direct impact	Indirect Impact
<b>Trade Policy</b>		
- Tariffs	↓	↑↓
- Import licences	↑↓	↑↓
- Services	↓	↑↓
- Non-tariff measures	↓	↓
<b>Trade-related Domestic Policies</b>		
- Trade-related intellectual property rights	↑↓	↑
- Investment measures	↑↓	↑↓
- Technical regulations	↑↓	↑↓
↑ = negative impact on technology adaptation		
↓ = positive impact on technology adaptation		
↑↓ = both impacts		

Within the above framework, the WTO rules may be said to impact on technology adaptation at two levels. First, the regulations may *directly* alter the conditions for technology adaptation (by improving access to technology imports, and by impacting on learning). Secondly, WTO rules may *indirectly* impact on technology adaptation by affecting the level of exogenous uncertainty. Figure 3 gives an overview of the impact of WTO regulations on those two levels. As there is no room here for an in-depth discussion of all the regulations,<sup>31</sup> the following analysis will concentrate on two areas: customs tariffs, as an example of rules in the area of traditional trade policy, and patent law, as an example of WTO rules in the area of domestic trade-related policies.

#### Direct Impact on Technology Adaptation

Access to foreign technology has been improved as a result of the WTO agreements in the sphere of tariffs on goods. Many developing countries have reduced tariffs on goods and services, including intermediate products, in which technology is often incorporated. As a result, it is easier for companies in developing countries to access foreign technology. However, the commitment of the poorer developing countries to lowering customs tariffs has been extremely limited so far.<sup>32</sup> This is likely to change in future negotiations, however. The industrial countries are exerting a great deal of pressure on the developing countries to bring the level of their bound tariff rates at least into line with their applied tariff rates. This will certainly be an important subject for the new round of trade negotiations.

Whereas access to technology is improved by import liberalisation, in particular in the field of intermediate products, the deprotection of industries can on the other hand hamper the learning process. As technology adaptation is a continuous process, in which learning occurs in the production process, the costs incurred by companies in developing countries go down as production is maintained. Learning, and the associated cost reduction, may therefore be frustrated if those industries are prematurely deprotected.

The direct impact of tariff liberalisation is therefore ambivalent: whereas access to technology is improved, the learning effects linked to technology adaptation can be hampered. The net effect might be different for the various sectors and the different groups of developing countries. It can be assumed that learning occurs in many developing countries, in particular in low income countries in simple technology areas, such as the production of consumer goods. Therefore the negative impact on learning might be greatest in those sectors.

In order to foster technology adaptation, the import liberalisation of sectors where learning effects are concentrated might be problematic. However, liberalisation can be expected to be very beneficial with regard to the imports of capital goods and some services where technology is relatively complex.

#### Patent Law

The TRIPS Agreement stipulates minimum standards in the area of intellectual property rights protection, including patent protection. Again, several impact levels on technology adaptation can be distinguished:

- In principle, stricter rules on patent law enhance R&D investments in the domestic economy. However, according to the stylised facts reviewed at the beginning of this article, it must be assumed that the technological evolution of many developing countries is not significantly influenced by their own R&D. In particular, the smaller and poorer developing countries do not have significant research capacities. Their main source of technological

<sup>31</sup> For an in-depth discussion of the various impacts, see J. K. Zattler, *op. cit.*, ch. 6-8.

<sup>32</sup> Cf. D. Bhattasali, M. Jayawickrama, P. Harrold: Practical Lessons for Africa from East Asia in Industrial and Trade Policies, in: World Bank Discussion Papers, No. 310, 1996. However, these countries have liberalised their imports unilaterally as part of their structural adjustment programmes.

progress is in adapting products and management techniques from developed countries to the local circumstances. Therefore, stricter patent law will not significantly foster R&D in those developing countries.

- Stricter international patent protection reinforces global R&D from which, in principle, developing countries also benefit. However, it is obvious that the acceptance of and adherence to minimum standards by the relatively small developing countries would not significantly influence global R&D. Again, the benefit for those developing countries would be negligible. The situation appears to be different, however, for more advanced developing countries with large markets.
- For the majority of developing countries, the most important question will be how stricter international patent protection will influence their access to existing foreign technology. Countries access foreign technology through trade, on the one hand, and through foreign investment or licence agreements with foreign companies on the other.

With regard to *trade*, stricter international patent law offers more insurance to the holders of technology in developed countries when exporting technology-intensive goods and services to developing countries: the risk of “expropriation”, i.e. uncompensated appropriation of the technology, is minimised from the point of view of the suppliers. Conversely, from the point of view of the economic agents in developing countries, the access barrier to those technologies is increased because of higher transaction costs. Whereas innovation rents in developed countries increase, technology adaptation and diffusion in developing countries becomes more expensive, either because firms in developing countries have to invest in R&D themselves or because of licence fees. If the level of adaptation falls, the learning effects for the whole economy might also be forestalled.

With regard to *investment*, more companies in developed countries would be ready to invest in developing countries because the risk of firm-specific knowledge being appropriated by technology imitators in developing countries would be reduced. In particular, the more advanced developing countries might benefit from such investment and licensing.

The extent of the various impacts depends on the specific characteristics of the respective country (level of development, size of the market etc.) and sector; in

particular, sectors in developing countries depending crucially on “reverse engineering” will be adversely affected, e.g. the software sector, the pharmaceutical industry<sup>33</sup> or some areas of the machinery and equipment sector. Furthermore, the negative impact of stronger patent protection is more likely to prevail in poor developing countries. With regard to the pharmaceutical industry the Doha Ministerial Conference stressed the importance of implementing and interpreting the Agreement on TRIPs in a manner supportive of public health, by promoting both access to existing medicines and research and development into new medicines and, in this connection, adopted a separate Declaration. The Declaration should make it easier for developing countries to allow parallel imports and to grant compulsory licences.

Crucially, the net effect of stricter patent protection will depend on the question of how minimum standards in this area are formulated, i.e. the breadth and duration of patent protection. An excessively broad patent system with relatively long protection periods can raise the price of one of the most vital inputs into the innovative process and thus reduce the pace of follow-on innovations.<sup>34</sup> With regard to the duration of patent protection, the TRIPS Agreement is already relatively strict, asking for protection of 20 years in all areas. With respect to the breadth of patent law, the TRIPS Agreement is relatively vague in many respects. It must be assumed, however, that at the forthcoming WTO negotiations OECD countries, and in particular the United States, will push for a broadening of patent protection. As an example, the TRIPS rules presently only commit member countries to providing patent and copyright protection. This implies that the copying of programmes is illegal but not the reconstruction and modification of programmes. The breadth of patent protection is also very relevant in the area of genetic resources. Relatively broad patents would constitute very serious market access barriers for innovative entrepreneurs in developing countries. As the Doha Conference did not decide to renegotiate the TRIPs Agreement it can be assumed that the vagueness of the rules will prevail for at least four to five years, well beyond the end of the now initiated new Round. However, this will

<sup>33</sup> It is well-known that countries such as India and Brazil built up national pharmaceutical industries based on the imitation of existing drugs. India abolished the patent protection of pharmaceutical products in 1970.

<sup>34</sup> J. E. Stiglitz: Knowledge as a Global Public Good, in: I. Kaul et al. (eds.): Global Public Goods – International Cooperation in the 21st Century, New York / Oxford 1999, p. 312.

probably not hinder the United States and other industrialised countries putting bilateral pressure on developing countries to enhance their patent protection beyond the disciplines of the Agreement.

### Indirect Impact – Implications for Exogenous Uncertainty

Generally speaking, legal certainty for economic activities is improved as a result of all WTO agreements because regulations are formalised and adherence to these regulations is guaranteed multilaterally. The notification obligations make trade policies more transparent and more predictable. The same applies to the Dispute Settlement Body. There are, however, a series of rules that could exacerbate the general level of uncertainty in developing countries. The following two examples concentrate again on the impact on macroeconomic uncertainty.

Import liberalisation by developing countries may impact negatively on national budgets because tariff reductions mean lower revenues where the imported quantity remains constant.<sup>35</sup> Also, external stability can be negatively affected as, all other things being equal, import demand goes up. Indeed, import liberalisation has in many cases been associated with a rise in the budget and current account deficit.<sup>36</sup>

However, the current account situation of developing countries is not only influenced by their own policies but also by the policies of the OECD countries. With regard to trade, the Uruguay Round agreements had the effect of lowering the tariffs for most industrial export products from developing countries.<sup>37</sup> In the medium term, market access for agricultural products, textiles and clothing will be improved. The forthcoming negotiations on trade in agricultural products under the “Built-In Agenda” reinforced by the Doha Ministerial Declaration will probably bring further improvement. Moreover, a number of countries have expressed their willingness to enhance market access for the poorest developing countries (LDCs). The EU has already abolished all quotas and tariffs for the products of the LDCs. This could considerably help to improve the export performance of this group of countries. The World Bank calculates an increase in their exports of more than 10%.<sup>38</sup>

As has already been emphasised, the TRIPS Agreement strengthens the position of the holders of intellectual property rights vis-à-vis technology imitators or adapters in developing countries. The

latter must pay a (higher) price for technology-intensive goods and services and licences in those areas. This puts an additional burden on the current account situation and also on the budget<sup>39</sup> of the developing countries, contributing to an exacerbation of the macroeconomic situation.

The case of biotechnology offers a good illustration of this point. Article 27.3(b) of the TRIPS agreement refers to the patent protection of biological resources and plant varieties. The article, which is presently under review in the WTO, puts the biotech companies in a stronger position vis-à-vis the developing countries than was the case before the TRIPS agreement was put into force and also when compared with the rules adopted under the Convention on Biological Diversity, which asks for fair benefit sharing between both sides.<sup>40</sup> However, here too the Doha Declaration gives some support to developing countries stressing the importance of taking fully into account the development dimension when examining the relationship between the TRIPS agreement and the Convention on Biological Diversity.

It is commonly assumed that the international protection of property rights is associated with a dynamic efficiency gain arising from the greater innovative activity. On the other hand – so the argument goes – there is a loss that arises from static inefficiency due to the under-utilisation of knowledge or to the underproduction of the good protected by the patent. The conclusion to be drawn from the analyses above is that with regard to developing countries – being “adapters” of imported technology – there is also a dynamic loss of efficiency associated with stronger patent protection; as stricter patent law might be an obstacle to technology adaptation, innovative i.e. “adaptive” activities are discouraged.

<sup>35</sup> There is, however, the possibility that the quantity of official imports increases after tariff reduction. This is often the case when large quantities of black market goods had previously been entering the market (e.g. because of porous borders or very high tariffs.)

<sup>36</sup> See J. K. Zattler, *op. cit.*, p. 136ff.

<sup>37</sup> Nevertheless, it has to be mentioned that the Uruguay Round led to an average reduction of trade-weighted tariffs for the products of the developing countries that is smaller than the tariff reduction for the trade amongst the OECD countries. See OECD: Trade and Development Issues in Non-OECD Countries – Tables and Appendices, Trade Directorate, Paris 2000, p.10.

<sup>38</sup> See World Bank: Leveraging Trade for Development, Background Paper to the Spring Meeting of the Development Committee, Washington 2001.

<sup>39</sup> E.g. in the case of pharmaceuticals, patent protection can result in higher expenditure for the public health system. The recent law suit in South Africa between the South African government and the main pharmaceutical companies has underlined this point.

<sup>40</sup> Cf. K. Liebig, *op.cit.*, p. 30 ff.