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GLOBALISATION  
IN DEVELOPING COUNTRIES:  
THE ROLE OF TRANSACTION COSTS  
IN EXPLAINING ECONOMIC  
PERFORMANCE IN INDIA

by

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Research programme on:  
Market Access, Capacity Building and Competitiveness

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## RÉSUMÉ

La quête des grands nombres dure depuis quelques années dans l'économie du commerce international : les modèles de libéralisation des échanges ont régulièrement produit des résultats qui, comparés aux données réelles *ex post*, affichent le signe attendu mais un « mauvais » ordre de grandeur. Ce document propose une nouvelle méthode, qui consiste à considérer la réduction des coûts de transaction comme un facteur explicatif important des performances réelles des pays en développement. Au lieu de présenter une estimation économétrique des coûts de transaction tirée d'équations à forme réduite, cette étude introduit clairement les coûts de transaction dans un système d'équations structurelles afin de construire un modèle de simulation d'équilibre général. Le premier objectif visé est donc de parvenir à une cartographie claire des voies par lesquelles l'évolution des coûts de transaction affecte les résultats économiques. Outre leur effet sur le revenu agrégé — cette fameuse question des grands nombres — ce document examine la manière dont les coûts de transaction influencent la répartition des revenus. Des simulations numériques réalisées à partir de l'exemple indien sont présentées.

## SUMMARY

The quest for large numbers has been going on for some time in international trade economics: models of trade liberalisation have consistently produced results that, compared *ex post* with real world data, show the right sign but the “wrong” magnitudes. This paper proposes a new approach by considering transaction costs reductions as an important factor explaining developing countries' actual performances. Rather than presenting econometric estimates of transaction costs from reduced form equations, this study explicitly introduces transaction costs in a system of structural form equations to build a general equilibrium simulation model. A clear mapping of the analytical channels through which changes of transaction costs affect the economic results is thus a primary objective. Additionally to the effect on aggregate income, the large number issue, this paper examines how transaction costs influence income distribution. Numerical simulations based on India are presented.

## I. INTRODUCTION

The quest for large numbers has been going on for some time in international trade economics: numerical simulation models of trade liberalisation in multilateral, regional or single-country contexts have consistently produced results that, compared *ex post* with real world data, show the right sign but the “wrong” magnitudes. These quantitative assessments normally use core general equilibrium models based on the theory of comparative advantage and the positive effects they are able to measure originate from static resource reallocation and disappearances of deadweight loss triangles. Unsatisfied by these meagre benefits estimates, economists had built new models that better explain the large gains observed for internationally integrating countries. Mainly they have gone into two directions, that of dynamics and that of non-convexities, i.e. economies of scale and imperfect competition<sup>1</sup>.

New models have incorporated the insights of a large literature that emphasises openness’ important role in boosting economic performances and growth. In a variety of theoretical approaches, a liberal external policy, by facilitating financial and trade flows, helps an economy to get its domestic prices right, to allocate its resources to their best uses, to acquire new technologies, to increase its primary factors’ productivity, to increase competition and X-efficiency, to reduce rent seeking, and even to improve its domestic governance. The strength of the links between trade policy and some of these positive effects is challenged by some authors and indeed the debate is still open, however models including some of these dynamic and non-convex features have produced larger numbers.

This paper proposes a complementary approach by considering reductions in transaction costs as an important factor explaining developing countries’ performance in the real world. This approach has also recently been advocated to explain the development failures of numerous African countries. According to Collier (1997, 98) many African countries face unusually high, and policy-induced, transaction costs that, by generating comparative disadvantages in manufactured exports, lower growth performance. Elbadawi *et al.* (2001) and Elbadawi (1998) argue that this transaction costs hypothesis is supported by empirical evidence, even when specific geographic and endowment variables are controlled for. This paper — rather than presenting econometric estimates of transaction costs from reduced form equations, as for the cited studies — explicitly introduces transaction costs in a system of structural form equations

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1. For surveys, Baldwin and Venables (1995), Brown (1993), Burfisher and Jones (1998), Francois and Shiells (1994), Hertel *et al.* (1997), US International Trade Commission (1998), and US International Trade Commission (1992).

to build a general equilibrium simulation model. A clear mapping of the analytical channels through which changes of transaction costs affect the economic performance of an economy is thus a primary objective of this study.

Additionally to the effect on aggregate income, the large number issue, this paper examines how transaction costs influence income distribution or, more simply, affect factors relative prices. In the simplest Heckscher-Ohlin-Samuelson (H-O-S) model of comparative advantage, trade liberalisation leads to a reallocation of resources and to production specialisation in those sectors that use intensively the country most abundant factor. This model predicts output shifts towards low-skill-labour intensive goods, increased demand for unskilled workers, and upward changes in their wage relative to the other factors' rewards. However, several authors have emphasised that empirical evidence contrasts with this prediction: increased relative wages for skilled labour are observed in many developing countries<sup>2</sup>. Without rejecting the H-O-S model, most studies explain this puzzling inter-skill widening wage gap by considering skill-biased technological change the primary cause for it and by attributing just a minor role to trade<sup>3</sup>. By considering the distributional effects of a reduction in transaction costs in addition to those due to productivity changes, some fresh insights in the trade and wage gap debate are offered here.

Beyond the analytical motivation for this exercise, the direct exploration of the effects of transaction costs on aggregate incomes and relative wages has valuable policy relevance. Firstly, showing that transaction costs reduction may be an additional important channel through which trade liberalisation affects incomes should help policy makers in gaining support for an outward-oriented development strategy. Secondly, domestic as well as international trade policies can influence transaction costs and given that these policies are often implemented as parts of comprehensive packages, their correct co-ordination becomes essential to their success. Because of the scope of indirect effects, the signs and magnitudes of induced adjustments are difficult to ascertain and the need for numerical simulation models of the type presented here becomes evident.

This study focuses on India by actually calibrating a series of trade models with transaction costs on Indian data for the mid 90s. This country undertook extensive market liberalisation towards the end of the 80s and began opening its economy to world trade soon after. Extensive controls have been removed and rent-seeking activity has reduced considerably, our approach attempts to quantify this deep structural transformation.

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2. Slaughter and Swagel (1997) cite evidence for Mexico; Meller and Tokman (1996) study the Chilean case; and Sanchez and Nuñez (1998) examine the Colombian case. See Davis (1992), UNCTAD (1997) and Wood (1997) for multi country studies covering this issue.
  3. For empirical evidence on the US, see Lawrence and Slaughter (1993), Krugman and Lawrence (1993), Leamer (1996), Baldwin and Cain (1997). See Abrego and Whalley (2000) for a survey of this debate and their original contribution.

The paper is organised as follows: Section II discusses the transaction cost approach by describing a simple partial equilibrium model followed by a brief review of the theoretical pedigree of the transaction cost idea and concluded by some evidence of its empirical relevance; Section III presents the structure of general equilibrium models used to study the effects of transaction cost reductions, its calibration on Indian data and the main numerical results; Section IV concludes. An appendix briefly surveys Indian economic policies likely to generate transaction costs and their major recent reforms.

## II. TRANSACTION COSTS: BASIC THEORY AND EMPIRICAL EVIDENCE

### A Very Simple Transaction Costs Model

The following four equations representing demand, supply and equilibrium conditions in a generic market can exemplify a simple partial equilibrium model with transaction costs:

$$\begin{array}{ll}
 P_d = a - b Q_d & \text{(demand function)} \\
 P_s = c + d Q_s & \text{(supply function)} \\
 Q_d = Q_s & \text{(market equilibrium)} \\
 P_d = P_s + T & \text{(transaction cost mark-up)}
 \end{array}$$

In the last equation transaction costs represent a wedge between the supplier and demander's price that is a fixed mark-up equal to  $T$  and paid by the demander on each unit of the good exchanged. The equilibrium quantity  $Q_e$  can easily be calculated as a function of  $T$  and of the other parameters as follows:

$$Q_e = \frac{a - c - T}{b + d}$$

and the basic comparative statics result is:

$$\frac{\partial Q_e}{\partial T} = -\frac{1}{b + d}$$

Thus it clearly appears that the quantity exchanged is reduced by rising transaction costs and that it can go to zero if these reach or are above the value  $(a - c)$ , which may be labelled the autarky limit. On the other hand and depending on the initial level of transaction costs, their reduction may *create* a market or simply increase the quantity exchanged.

In this simple set-up, if one thinks of  $T$  as if it were an excise tax, the following crucial question should arise: "what happens to the *revenues* ( $Q_e * T$ ) collected from this tax?" If these revenues simply disappear, then clearly a reduction in  $T$  would be a sort of windfall with positive effects. If instead other agents in the economy received these revenues, then the net effect of a reduction in transaction costs should be calculated by considering both winners and losers.

A first important point should already be apparent: transaction costs reduction corresponds to *rectangles* reduction and thus have larger impacts than the usual reduction of deadweight loss *triangles*. A model including transaction costs can then fit



the large numbers observed in reality with or without recurring to exogenous or endogenous technological change, but what about the income distribution question? Before fully answering this second important question, consider a brief digression on the productivity (technological change) approach.

### Technology and Relative Poverty

The reason why technological progress can have a strong distributional and poverty effect is intuitive: if a new technology increases the efficiency of a certain factor of production over that of the others, then it directly confers higher economic rewards to the owners of this more efficient factor given that its demand will increase proportionally more than that of the other less efficient factors. More formally, consider an economy where goods are produced using just two factors, skilled and unskilled labour, and that unskilled workers represent the poor. Firms demand labour of the two categories up to the point where the value of the production of an additional worker covers the cost of employing her. In a simple formula this is:

$$L_d = P * MPL \quad (1)$$

Equation (1) states that labour demand is equal to the marginal product of labour (*MPL*) in value (i.e. multiplied by the price *P* at which it can be sold in the market). Factors' rewards are determined by the equality of their demands and supplies. To keep things very simple, assume full employment that is equivalent to have fixed labour supplies.

In this framework we can consider two types of technological shocks. In the first, the shock affects the efficiency of skilled and unskilled workers in the same way (factor neutral case); in the second, technological progress is skill-biased and one factor becomes more efficient than the other (factor biased case). Poverty effects are easily traceable since they correspond to the wage ratio of skilled over unskilled workers, as defined in equation (2):

$$\frac{W_s}{W_u} = \frac{P \cdot MPL_s}{P \cdot MPL_u} = \frac{MPL_s}{MPL_u} \quad (2)$$

Clearly, with factor neutrality the same change affects both marginal productivities thus leaving the wage ratio equal to the value it had in its initial equilibrium. The whole economy becomes more efficient, goods production goes up (with the same quantity of resources), and the rewards go to the poor in the same way as they go the non-poor. If a hypothetical poverty line were exceeded thanks to the new higher wage, no more poor would exist in this simple economy.

With factor bias, and suppose that the new technology makes skilled labour more efficient, inequality would rise given that the wage ratio would be higher after the technological shock. However notice that this particular increase in inequality does not translate into an increase in *absolute* poverty, given that the wage rate of the poor (unskilled) goes up as well.

A straightforward variation of this simple framework can be used to construct a case where technological progress, even in its factor-neutral form, can indeed increase relative as well as absolute poverty. The variation consists of moving from a partial equilibrium approach exemplified above to a general equilibrium setting where there are two sectors of production that employ skilled and unskilled labour with different intensities. Consider, for instance, an economy with an advanced and a traditional sector, and that the former uses proportionally more skilled workers than the latter. Assume now that a new factor neutral technology is introduced in this economy and that it is initially adopted by the advanced sector and not by the other. Production in the advanced sector becomes more profitable and more firms enter the sector. Its expansion occurs at the expenses of a contracting traditional sector, now less profitable. Given the different factor intensities of the two sectors, skilled workers, employed in the advanced sector at a rate exceeding that at which they are released by the traditional sector, experience high demand for their services and rising wages; the opposite situation affects unskilled workers whose demand in production as well as wages are decreasing. If unskilled workers were initially above the poverty line and the wage decrease leaves them below, then absolute poverty would have been caused by a factor neutral sector biased technological change.

Numerous variations of this basic set-up have been provided in the literature. One can think of production that requires more than two factors and that certain factors are complements and other substitute. A realistic case may involve firms adopting a technology that uses simultaneously more of capital and skilled labour thus leaving less capital available for unskilled labour and reducing its productivity and wage. Another extension considers more sophisticated modelling of labour supply including either education and training, or migration. In such models, the larger the initial wage ratio the larger the incentive to acquire education or to migrate; the equalising forces ensuing from increasing supply of skilled workers, would probably take time to materialise and may be at the origin of an inverted-U shaped curve mentioned above. Finally international flows of goods, factors, and technologies may be considered.

The transaction costs approach used here shows that, even by abstracting from these productivity effects, transaction costs shocks can have similar distributional effects. In a more complete model these can then be added or netted out from the above-cited productivity effect. But before showing how a standard general equilibrium trade model can be modified to take into account transaction costs, a brief description of their theoretical pedigree and empirical relevance is provided in the remainder of this section.

### **Transaction Costs Theory**

Since the seminal work of Coase, transaction costs economics has tried to resolve the apparent inconsistency in the co-existence of markets and firms or, in current terms, of markets and institutions. Coase observed that if markets were perfect forms to organise production and exchange there would not be a need for firms to emerge or, by turning the argument around, if firms had advantages over markets why shouldn't we observe a single giant firm producing all that is demanded. His fundamental intuition was that differential transaction costs generate situations where both firms, or institutions, and

markets are observed. In terms of the simple model above, there are certain types of activities for which transaction costs are above the autarky limit and exchanges take place inside institutions, and other types for which a market exists because transaction costs are below that limit. This has been an extremely significant contribution and it is probably one of the founding ideas of the voluminous transaction costs and institutional economics literature that followed<sup>4</sup>. This literature is not free from criticism, in particular sceptics point out the difficulty in making the concept of transaction cost operational. In Goldberg words, explaining economic phenomena by appeals to transaction costs “is the all encompassing answer that tells us nothing”.

Another approach uses the concept of transaction costs in a less abstract and perhaps less interesting way but it may be more helpful for the purpose of understanding how changes in transaction costs may explain developing countries performance. The crucial difference of this approach is that rather than being concerned about changes in transaction costs close to the breaking point of the autarky limit, it considers how exchanges already taking place in the market may be affected by variations in transaction costs.

The antecedents to this approach may be found in general equilibrium theory and international trade. In an effort to enrich the theory of general equilibrium as formulated by Arrow and Debreu<sup>5</sup>, a few authors<sup>6</sup> have studied how this should be modified to incorporate transaction costs and what would be the consequences of such a modification on the major predictions of the standard theory. In Foley’s words “the key aspect of the modification I propose is an alteration in the notion of ‘price’. In the present model there are [...] a buyer’s and a lower seller’s price [and their] difference yields an income which compensate the real resources used up in the operation of the markets”. This can be considered as a first answer the question posed above: where do transaction costs revenues go? When the operation of a market needs intermediaries that provide information or other services to buyers and sellers so that they can realise an exchange, then these intermediaries would receive the income generated by charging a transaction *fee* (=cost).

Another form of transaction costs has been considered in international trade and explicitly incorporated into models since Samuelson’s paper<sup>7</sup> of transport costs. The basic idea here is that trade involves transaction costs and that these may be simply thought of as a fraction of the traded good itself, as if “only a fraction of the ice exported reaches its destination as un-melted ice”. This “iceberg model” provides another answer to the basic question on the fate of the transaction costs’ revenues and it clarifies how a reduction in transaction costs saves real resources and makes an economy more efficient.

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4. For a recent survey see Williamson (2000).
  5. See Debreu (1959).
  6. Kurz (1974), Hahn (1971), Foley (1970).
  7. Samuelson, P.A. (1954).

## Transaction Costs: Empirical Basis

Real world situations present numerous examples of transaction costs, however it is possible to group them in three broad categories, namely geography-, technology/infrastructure-, and institution/policy-related transaction costs. Notwithstanding their overlapping, these categories allow organising a large and disperse body of empirical evidence.

A major example of the first category is given by transportation margins. These are also probably the easiest to observe and possibly to measure. In an international context they can be measured by the c.i.f./f.o.b. ratio giving the “carriage, insurance and freight” costs of countries’ imports. Henderson *et al.* (2001) estimate that they can “range from a few per cent of the value of trade, up to 30-40 per cent for the most remote and landlocked (and typically African) economies”. Limao and Venables (2002) find that being landlocked raises transport costs by more than 50 per cent and that the level of infrastructure development is an important variable in explaining differences in shipping costs. Estimates for within country trade and transport costs are not easily available, however, even if smaller, distances may still play a role in generating transaction costs in national markets. In a recent study on Africa, Elbadawi *et al.* (2001) show that domestic transportation costs are an even stronger influence on export (and growth) performance than international transport costs.

Additionally, in developing countries, poor people usually living in rural or remote areas are often victims of high transaction costs that partially disconnect them from the rest of the society. Jalan and Ravallion (1998) find that road density was one of the significant determinants of household-level prospects of escaping poverty in rural China<sup>8</sup>. Any technological advance providing the poor with better and cheaper access to national and international markets should, at least in principle, help them.

The second category of transaction costs includes those related to technology and infrastructure. It is clear that drastic technological innovations affecting the whole infrastructure of an economy and having the potential to be used in a variety of sectors, such as steam power, electricity, telecommunications, can have profound effects on transaction costs and indirectly on an economy’s growth and poverty record<sup>9</sup>. As shown in Table 1, the margin of manoeuvre in improving access to basic infrastructure for the poor is quite large.

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8. See also Antle, J.M. (1983), “Infrastructure and Aggregate Agricultural Productivity: International Evidence”, *Economic Development and Cultural Change*, 31(3): 609-19. Fan, Shenggen, Peter Hazel and Sukhadeo Thorat. (1999). “Linkages Between Government Spending, Growth and Poverty in Rural India.” Research Report 110, International Food Policy Research Institute, Washington DC.

9. A recent literature labels these technologies as “General Purpose Technologies”. See Helpman, Elhanan (1998), and Bresnahan *et al.* (1995).

**Table 1. Percent of Poor Households with Infrastructure in Home, in Poorest Urban and Rural Deciles in Each Country**

Country	Electricity		In-house water		Sewer		Telephone	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Asia								
Pakistan	88	44	34	5	20	0	1	0
Vietnam	57	16	4	0	-	-	-	-
Nepal	43	1	7	4	7	0	0	0
Eastern Europe & Central Asia								
Russia	-	-	84	31	78	12	39	13
Kazakhstan	100	100	78	12	70	8	38	20
Bulgaria	100	100	84	27	86	18	51	20
Albania	100	100	90	0	-	-	0	0
Kyrgyz	99	99	54	5	22	3	20	5
Latin America & the Caribbean								
Panama	91	2	36	4	25	0	20	0
Jamaica	55	44	23	2	15	6	10	6
Ecuador	92	63	25	7	42	5	5	0
Nicaragua	71	13	44	4	9	0	0	0
Sub-Saharan Africa								
South Africa	32	8	23	1	-	-	6	0
Côte d'Ivoire	39	8	7	0	-	-	-	-
Ghana	38	0	2	0	-	-	-	-

A clear example of technology/infrastructure transaction costs can be seen in the information and communication sector. The Internet explosion and its connected technologies have dramatically reduced exchange and search costs in most OECD countries. Although just indicative and not directly transferable to developing countries, some estimates for the cost savings (i.e. reduction in transaction costs) due to B2B electronic commerce are available for a few sectors of the US economy and are reported in Table 2.

**Table 2. Potential Cost Savings from B2B Electronic Commerce in the US**

Industry	Potential cost savings(%)	Industry	Potential cost savings (%)
Electronic components	29-30	Chemicals	10
Machining	22	MRO	10
Forest products	15-25	Communications	5-15
Freight services	15-20	Oil and gas	5-15
Life sciences	12-19	Paper	10
Computing	10-20	Healthcare	5
Media & advertising	10-15	Food ingredients	3-5
Aerospace machining	11	Coal	2
Steel	11		

Source: Goldman Sachs (1999) cited in KPMG report The Impact of the New Economy on Poor People and Developing Countries for DFID.

Related to the above, an interesting working paper by Freund and Weinhold (2000) finds that, when introduced in a standard gravity model, cyber-mass (i.e. internet hosts per capita) is a significant positive variable that, while increasing the overall explanatory power of the regression, does not reduce the magnitude and significance of the physical distance.

Indirect evidence of technology/infrastructure-related transaction costs is found by looking at the level of manufacturing inventories across countries. Guasch and Kogan (2000) report on huge inter country differences in inventory levels. Table 3, taken from Guasch and Kogan (2000), reports on the very large disadvantage of Latin American economies vis-à-vis the US with respect to inventories: on average these countries hold twice as much raw material and finished products as the US. According to the authors, higher transaction costs explain a relevant part of these inventories discrepancies: Latin American countries faced with uncertain demand, longer delays in shipments, and larger costs for small frequent shipments, choose to maintain larger reserves. Considering that the cost of capital is normally higher in Latin America than in the US, the authors point out that these high inventory levels translate into considerable costs and ultimately in lower competitiveness and diminished growth.

**Table 3. Latin America Ratios to US Inventories (all industries)**

Raw Materials Inventory Level Ratios: Ratio to US Level by Industry (average of all available data for 1990s)								
	Chile	Venezuela	Peru	Bolivia	Colombia	Ecuador	Mexico	Brazil
Mean	2.17	2.82	4.19	4.20	2.22	5.06	1.58	2.98
Minimum	0.00	0.30	0.10	0.11	0.52	0.86	0.42	0.8
1st Quartile	0.36	1.87	1.25	1.39	1.45	2.55	1.06	1.6
Median	1.28	2.61	2.30	2.90	1.80	3.80	1.36	2.00
3rd Quartile	2.66	3.12	3.90	4.49	2.52	5.64	2.06	3.1
Maximum	68.92	7.21	31.1	34.97	13.59	20.61	3.26	7.1
Final Goods Inventory Levels: Ratio to US Level by Industry (average of all available data for 1990s)								
	Chile	Venezuela	Peru	Bolivia	Colombia	Ecuador	Mexico	Brazil
Mean	1.76	1.63	1.65	2.74	1.38	2.57	1.46	1.98
Minimum	0.01	0.10	0.39	0.11	0.19	0.67	0.35	0.75
1st Quartile	0.17	0.87	1.17	1.13	1.05	1.67	0.82	1.1
Median	0.72	1.60	1.54	2.02	1.28	1.98	1.36	1.60
3rd Quartile	1.38	2.14	2.11	3.18	1.63	2.86	2.14	2.00
Maximum	31.61	5.29	3.87	21.31	5.31	7.94	4.91	5.2

Source: Guasch and Kogan (2000).

The last category of transaction costs includes those related to institutions or economic policies. Rent seeking is probably the most well known example, however, even by just considering trade policy, a few others are worth mentioning.

A well-established literature finds that an international border has a large dampening effect on trade. This has also been termed the home bias in trade. Most of the literature is focussed on the Canada-US trade, but this empirical puzzle applies to any region of the world. Obstfeld and Rogoff (2000) label the home bias in trade one of the "six major puzzles in international macroeconomics". With the existence of large home biases firmly established, the search for explanations has begun. Evans (2000) finds little support for the hypothesis that the home bias is not due to the border itself but

instead to inherent differences in domestic and foreign goods; Obstfeld and Rogoff (2000) argue that empirically reasonable trade (i.e. transaction) costs can explain much of the home bias; and Anderson (2000) points to information costs and imperfect contract enforcement as worthwhile avenues of inquiry.

Deep policy switches such as the creation of the common European market in 1992 have also induced researchers to evaluate their economic impacts. A large collection of studies known as the "Costs of Non-Europe", supported by the European Commission, mainly consists of detailed estimations of the costs of the borders in Europe. The most cited reference is the Checchini report that finds that these costs are considerable up to a small percentage of the European GDP. Harrison, Rutherford and Tarr (1996) explicitly model these costs in a general equilibrium framework and reach similar conclusions.

Another more recent example of trade-policy related transaction costs is found in Hertel *et al.* (2001). The particular trade liberalisation policy evaluated in their study includes a series of measures intended to lower non-tariff trade costs between Japan and Singapore. In fact, by imposing the adoption of computerised procedures, an explicit objective of this policy was a reduction of the costs of customs clearance, a clear policy-related transaction cost. For the case of the Japan-Singapore FTA, the effect of linking the two customs' systems is expected to generate additional reductions in effective prices amounting to 0.065 per cent in Japanese imports from Singapore and 0.013 per cent in Singaporean imports from Japan, and these cost saving refer solely to the cost of reduced paperwork, storage and transit expenses. However, in addition to the direct cost savings, there are indirect savings associated with the elimination of customs-related delays in merchandise flows between these two countries. Hummels (2000) emphasises that such time-savings can have a profound effect on international trade by reducing both "spoilage" and inventory holding costs. He argues that spoilage can occur for many types of reasons. The most obvious might be agricultural and horticultural products that physically deteriorate with the passage of time. However, products with information content (newspapers), as well as highly seasonable (fashion) goods may also experience spoilage. Hummels points out that inventory costs include not only the capital costs of the goods while they are in transit, but also the need to hold larger inventories to accommodate variation in arrival time. He finds that the average value of firms' willingness to pay for one day saved in trade is estimated to be 0.5 per cent *ad valorem* (i.e. one-half per cent of the value of the good itself). This value of time-savings varies widely by product category, with the low values for bulk commodities and the highest values for intermediate goods.

In summary, even if in identifying empirical estimates for transaction costs we have stretched their definition to include quite different things, it seems clear that geographic characteristics, poor transportation and communication infrastructure, and bad economic policies may directly affect transaction costs, and that their presence can be documented in a variety of ways.

For numerous examples of India specific transaction costs, refer to the appendix of the paper and the references cited therein.

### III. TRANSACTION COSTS: SOME THEORY-CONSISTENT NUMERICAL SIMULATIONS FOR INDIA

The following section considers two different ways of modelling transaction costs and several analytical structures to test how these modelling choices affect the evaluation of the effects on aggregate income and relative poverty of a reduction in transaction costs. The ultimate objective is to draw conclusions on the main channels of transmission from transaction costs reduction to income determination (its level and distribution) and their likely empirical relevance in the real world, and to do that different model versions are parameterised on India.

Transaction costs are modelled as either a mark up on the seller's price or as icebergs melting a la Samuelson. With the former approach transaction margins generate income and they are fully comparable to transportation margins, with the latter they simply produce costless inefficiencies. Besides these costs can affect transactions in the goods market as well as in the factor markets.

The basic general equilibrium model used here represents a small price taker economy and it is implemented here in three main versions: the first version is a standard Heckscher-Ohlin international trade model with homogeneous goods, the second introduces intermediate consumption, and the third considers a model with differentiated goods which generalises the Heckscher-Ohlin structure. A main contribution of the paper consists of pointing out how differences in structural models matter for the estimation of the effects of transaction cost reductions.

#### III.1. The Indian Economy: Stylised Facts of a South Asian Developing Country

The crucial characteristics of our initial data for India are shown in Table 4, where it is possible to observe some of the stylised facts of a typical developing country. The economy has been aggregated into two sectors: an export oriented sector (*Exportables*) and an import competing one (*Importables*). The first two rows in the table show the relative size of the two sectors and their trade intensity (measured as exports or imports over production). As expected by observing that India is relatively abundant in unskilled labour, its exportables sector uses more intensively this factor of production. The initial wage gap, measured as the ratio of skilled over unskilled labour average incomes, is quite high with more skilled workers earning almost five times more than unskilled workers. Exportables and importables use a similar share of intermediates in production and bear an almost identical transaction cost, as shown by the *ad valorem* estimate.



Table 4. Initial 1994 Data – Main Characteristics

	Sectors		Economy-wide
	Exportables	Importables	
Production shares %	46	10	
Trade intensity %	54	8	
Skill Abundance Unskill / Skill			7.4
Skill Intensity Unskill / Skill	65.9	11.1	
Skill Wage gap			4.7
Intermediates as % of Production	50.6	50.3	
Transaction Costs sector allocation	45	55	
Transaction Costs ad valorem %	15.0	13.0	
Ownership shares	Skill labour	Unskill labour	
Rural Heads own	21	79	
Urban Heads own	59	41	
Consumption Shares	Skill Head	Unskill Head	
Exportables	59	49	
Importables	41	51	

Source: 1994 SAM for India (Pradhan B., K.A. Sahoo, and M.R. Saluja (1999)) and authors calculations.

Notice also that transaction margins (when modelled as mark-ups) generate income that is allocated across sectors in the same way as total demand (45 per cent goes to exportables and 55 to importables). This deserves some further comment: whenever transaction margins are reduced, the price wedge between seller and buyer is narrowed, and the total revenues raised fall; initially these revenues are used to buy exportables and importables in fixed shares and these shares are chosen to reflect the structure of total demand so that they should be as neutral as possible. With this assumption, a fall in revenues should not directly affect the overall demand structure. Clearly, another way of thinking of the sectoral allocation of transaction margin income is that transaction costs are produced using exportables and importables as inputs. The current sectoral allocation may not reflect the real world “production structure” of transaction costs nevertheless, without additional empirical evidence, the current choice allows to by-pass the problem without introducing unjustifiable biases<sup>10</sup>.

Additionally, Table 4 displays households’ shares of factor ownership and goods consumption. Households have been grouped into rural and urban and the factors ownership structure shows that rural household are receiving a very large share of their income from unskilled labour. Overall consumption shares do not differ greatly across households.

Most of the estimates shown in the table are direct calculations from India’s national accounts and input-output tables, however transaction costs have been

10. In fact one can think of two alternatives to this assumption: in the first, if it were known that producers of transaction services are include exclusively in the importables sector, then transaction cost revenues could be entirely allocated to buy output from the importables sector. Alternatively, it may be possible to estimate a transaction cost production function that uses a mix of primary factors. In this case producers of transaction services would minimise their cost of production subject to a budget constraint that equals transaction costs revenues.

estimated using raw data on geographic distances and inputs of transport/communication/distribution services.

In summary — in this set-up given similar sectoral *ad valorem* transaction margins, their neutral revenue allocation and the across household similar consumption pattern — a reduction in goods markets' transaction costs affects households' poverty and income mainly through changes in factor rewards.

### III.2. Model 1: A Simple Heckscher-Ohlin Homogeneous Good Trade Model

The model includes two tradable homogeneous commodities, two factors of production and two households.

*Production.* The economy produces two goods, an aggregate exportable commodity (X) and an importable commodity (M), using combinations of skilled and unskilled labour in a Cobb-Douglas constant returns to scale technology as follows:

$$Q_i = \eta_i Ls_i^{\alpha_i} Lu_i^{1-\alpha_i} \quad \text{with the commodities index } i = X, M \quad (1)$$

where  $Q_i$  represents the quantity produced of the two goods,  $\eta_i$  a parameter standing for sector specific technical level, and  $\alpha_i$  and  $(1 - \alpha_i)$  the Cobb-Douglas output elasticities with respect to skilled and unskilled labour ( $Ls$  and  $Lu$ ). Factor neutral technology shocks similar to those mentioned above would entail changes in the parameter  $\eta_i$ .

*Factor markets.* We assume full employment of fixed endowments of skilled ( $\bar{Ls}$ ) and unskilled ( $\bar{Lu}$ ) labour, so that their supplies will be completely un-elastic with respect to their prices. These are thus determined by firms' demands that, in competitive markets, are equal to their marginal product in value:

$$ws = \alpha_i P_i \frac{Q_i}{Ls_i} \quad i = X, M \quad (2)$$

$$wu = (1 - \alpha_i) P_i \frac{Q_i}{Lu_i} \quad i = X, M \quad (3)$$

where  $ws$  and  $wu$  are the wages for the two types of labour respectively, and  $P_i$  is the producer commodity sale price.

*Transaction costs.* These are modelled as a mark-up on commodity prices. This is equivalent to an excise tax or a transport margin and, since they do not increase with the value of the exchanged commodity but are proportional to their quantity, they are consistent with the empirical hypotheses on transaction costs described above:

$$Pt_i = P_i + t_i \quad i = X, M \quad (4)$$

revenues generated by the wedge  $t_i$  between the seller and buyer's price are equal to  $\sum_i t_i Q_i$ , and are used to buy transaction services from both sectors of the economy according to the fixed structure described above.

*Consumption.* The model includes two households, a skilled headed (HHs) and an unskilled headed (HHu) household, that receive income from selling factor services and demand commodities via an optimisation of a Cobb-Douglas utility function. Households are thus differentiated by their consumption patterns and according to their ownership shares, with the skilled-headed household representing loosely the rich household. Derived consumption demands are as follows:

$$Qd_{Hi} = \beta_{Hi} \frac{Y_H}{P_{t_i}} \quad \text{with the household index } H = \text{hs, hu and } i = X, M \quad (5)$$

where Qd represents the household-specific quantity demanded,  $\beta$  a utility share parameter, and Y the household's income.

*Trade and equilibrium conditions.* Imports, exports and domestically produced goods are homogeneous, so that trade, in any of the two goods, can only be one-way (either import or export) and it originates only when domestic demand and supply differ. In equilibrium, trade balance as shown below will hold:

$$\sum_i Pw_i T_i = 0 \quad i = X, M \quad (6)$$

Producers' prices are equal to the world prices given the small country assumption, and export or import flows quantities will be derived from the equality of supply and demand where the latter includes final consumption as well as transaction services demands:

$$P_i = Pw_i \quad i = X, M \quad (7)$$

$$Q_i + M_i = \sum_H Qd_{Hi} + Q_{t_i} + X_i \quad i = X, M \quad (8)$$

Factors' market-clearing conditions simply state that the sums of factors demands must equal the fixed factors' endowments.

$$\sum_i L_i = \bar{L} \quad \text{and} \quad \sum_i K_i = \bar{K} \quad i = X, M \quad (9)$$

In this simple model the poverty measure is a relative poverty index equal to the ratio of skilled to unskilled labour rewards. Given fixed factors ownership shares for the rural and urban households and a poverty line, it would not be difficult to calculate absolute households' poverty measures. The advantage of considering household-specific absolute poverty indices is that we would be able not only to trace the effects of changes in transaction costs on the supply/income generation side, but also on the demand/income use side.

### III.3. Model 2: A Simple Heckscher-Ohlin Homogeneous Good Trade Model with Intermediate Goods

This model introduces a simple variation in the previous one: the use of intermediate goods in the production process. Intermediates are employed in fixed proportion to production with a standard Leontief structure, so that equations (7) and (8) now become:

$$P_i = Pw_i - \sum_i (Pw_i + tc_i) a_{ji} \quad i = X, M \quad (7b)$$

$$Q_i + M_i = \sum_H Qd_{Hi} + \sum_i Q_i a_{ji} + Qt_i + X_i \quad i = X, M \quad (8b)$$

where  $a_{ji}$  are the Leontief intermediate shares; notice that  $P_i$ 's now become value added prices and these are equal to world prices minus the cost of intermediates which are valued at world prices plus transaction cost mark-ups.

### III.4. Model 3: A Heterogeneous Good Trade Model

This third model introduces several variants to the ones described above. First of all transaction costs are modelled as iceberg wedges, i.e. the quantities sold by suppliers reach the purchasers with a certain fractional loss (some quantity of the commodity melts away). In this way transaction costs do not generate any income (or revenue) and they are in fact denominated in the same units of measurement (i.e. real value or quantity) of the good exchanged. In simplified terms the quantity equilibrium in a specific market would be:

$$Q_i^S = Q_i^D tc_i \quad (9)$$

where  $tc$  is a number greater than 1 representing the "melting" due to the transaction cost.

In addition imports and domestically produced goods are imperfect substitutes in consumption. Of the domestically produced goods one is not traded and only consumed at home and the other is either exported or consumed. These changes alter the fixed world price structure of the homogeneous goods model and allow for the price of the domestically good, which is imperfectly substitutable with the imported one, to differ from the world price. This type of model has been extensively used in the literature and its properties are well known<sup>11</sup>.

In this model there are three goods which enter the consumer utility function, an import good M, a domestic non traded good D, and an export good X. Domestic production occurs only for D and M with a CES technology that includes only skilled and unskilled inputs (the CES function represents another difference form the models shown above).

The production function is:

$$Q_i = [\beta u_i (Lu_i)^{-\rho_i} + \beta s_i (Ls_i)^{-\rho_i}]^{1/\rho_i} \quad i = M, D$$

Factor markets equations remain unaltered apart from the obvious changes due to the new functional form. Prices for commodities M and X are fixed and endogenously determined for the non-traded commodity D; in fact supply and demand equilibrium such as in equation (9) determines the price of D.

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11. See de Melo and Robinson (1989) or more recently Bhattacharya *et al.* (1999).

### III.5. Numerical Results

These simple general equilibrium models can be used to conduct a basic experiment aimed at investigating the analytics of the link between relative poverty and transaction cost and the aggregate effects of a reduction of the latter; the following numerical results should not be considered exact estimates, but just indications on the potential magnitude and sign of that effects.

As already described in the introduction, for a large body of literature, both empirical and theoretical, globalisation/openness improves an economy's performance beyond the near disappearance of tariffs' deadweight loss triangles. In this study, openness is supposed to bring innovations in the transaction technology and their adoption is modelled by a decrease in transaction costs without any indirect effect on the productivity of primary factors.

A first set of experiments, by using the three models described above, considers exogenous reductions of transaction costs affecting the goods markets and estimates their effects on real income and on the wage gap. In terms of the model's parameter, the experiments consist of a shock that reduces  $t_i$  in equation (4) or  $tc_i$  in equation (9). A second set of experiments considers exogenous reductions of transaction costs in factor markets. A final experiment reverses the logic of the first two sets of experiments by shocking the economy with the observed changes in real income and the wage gap (and other exogenous variables such as factor supplies, technological progress, and international terms of trade), and thus estimating the change in transaction costs.

Table 5 shows the results for model 1 of *experiment 1*: "50 per cent reduction of exogenous transaction costs in goods markets for all goods and all agents". Given the fixed world prices and un-elastic supplies of labour, a reduction in transaction costs does not produce any change neither in domestic producers' prices nor in factor rewards so that incentives to alter output levels do not arise and output of both sectors stays constant. Relative poverty, the ratio of skilled over unskilled wage, does not change due to the fact that resources do not move across sectors. In this model, consumption due to transaction costs revenues is substituted by households' consumption (or exports) that can increase without an accompanying increase in domestic output.

Table 5. **Basic Experiment of Reduction in Transaction Costs**,  
percentage variations with respect to initial equilibrium – model 1

Percent variations	%		%
Output of Exportables	0.0	Exportables demand by HHr	13.2
Output of Importables	0.0	Importables demand by HHr	10.8
Producer price of Exportables	0.0	Exportables demand by HHu	13.2
Producer price of Importables	0.0	Importables demand by HHu	10.8
Exports (volume)	7.5	Tc demande of exportables	- 43.6
Imports (volume)	5.0	Tc demand of importables	- 44.8
Wage S	0.0	Real HHr income	11.7
Wage U	0.0	Real HHu Income	11.7
Ratio $W_s / W_u$	0.0	Total Real Income	11.7

It should be emphasised that even with different initial transaction costs across sectors or with a sector bias in reduction of transaction costs, these results would not qualitatively change: output and factor rewards will be still unaltered.

An important result obtained with this very simple model is that large increases, of more than 10 per cent, are registered in real incomes. These are large numbers and their occurrence is entirely due to the elimination of the deadweight rectangles of transaction costs (rather than the elimination of triangles associated for example to tariff reductions).

The same experiment, reduction of 50 per cent of transaction costs mark-ups, produces quite different relative poverty results when intermediates are introduced in the production process as in model 2. In this case the reduction of transaction costs changes the relative profitability of the two sectors: the exportables sector, using a larger share of intermediates, enjoys larger savings than the importables one. This translates into a larger increase of the value added price of exportables, 6.3 per cent in contrast with 5.9 per cent for importables, and into a large increase of exportables output (see Table 6). Exportables use intensively unskilled labour that now enjoys an increase in its reward: the relative poverty index improves by about 1 per cent.

**Table 6. Basic Experiment of Reduction in Transaction Costs,**  
percentage variations with respect to initial equilibrium – model 2

Percent variations	%		%
Output of Exportables	0.9	Exportables demand by HHr	13.6
Output of Importables	- 0.8	Importables demand by HHr	12.7
Val. Added price of Exportables	63	Exportables demand by HHu	13.3
Val. Added price of Importables	59	Importables demand by HHu	12.3
Exports	- 4.4	Tc demande of exportables	- 46.7
Imports	- 10.7	Tc demand of importables	- 47.1
Wage S	5.6	Real HHr income	13.2
Wage U	6.4	Real HHu Income	12.9
Ratio Ws / Wu	- 0.8	Total Real Income	13.1

How robust is the relative poverty result? It can be easily shown that it crucially depends on the sectoral differences in the Leontief  $a_{ij}$  coefficients, which directly influence the size of the savings due to the reduction in transaction costs. The same experiment performed on an Indian economy where all sectors were assigned the same intermediates coefficients would produce identical changes in both skilled and unskilled wages, even in the case of sectorally unequal transaction costs mark-ups.

It should be stressed though that a reduction in transaction costs brings positive increases in both labour types wages so that absolute levels of poverty (and welfare) should be reduced (increased) with a reduction in transaction costs.

Given that model 3 introduces a third non-tradable sector, before commenting experiment results, a new table with the salient characteristics of the Indian economy is shown below.

Table 7. Initial Data – Main Characteristics with a Non-Tradable Sector

	Importables	Sectors Exportables	Domestic	Economy-wide
Production shares %		47	53	
Trade intensity %	100	24	0	
Skill Abundance Unskill / Skill				7.4
Skill Intensity Unskill / Skill		23.7	3.3	
Skill Wage gap				4.7
Transaction wedge (goods mkts)	1.15	1.15	1.13	
Transaction wedge (factors mkts)				
Skilled workers	1.20	1.20	1.20	
Unskilled workers	1.20	1.20	1.20	

Table 7 displays the main changes that affect the structure of the initial Indian data for this third model and it should be contrasted with Table 4 above. Salient features are the high skill labour intensity in the production of domestic non-traded goods (this is derived mainly from the production structure of non-tradable services that include a high percentage of white collar workers of the government sector, a large employer in India), and the lower transaction wedge experienced in exchanges in the same sector.

Table 8. Basic Experiment of Reduction in Transaction Costs, percentage variations with respect to initial equilibrium – model 3

Percent variations	%		%
Output of X	0.03	HH demand of M	7.2
Output of D	- 0.03	HH demand of X	6.9
Price of M	0.00	HH demand of D	6.1
Price of X	0.00		
Price of D	- 0.03		
Exports	7.09		
Imports	0.15		
		Real HH income	6.5
Wage S	- 0.06		
Wage U	0.01		
Ratio Ws / Wu	- 0.08		

Results from the basic experiment performed with the third model are shown in Table 8. The main novelty here is that a reduction in transaction cost seems to have a lower effect on aggregate income. This qualitatively different outcome can be fully explained by the initial sectoral difference in transaction wedges. In model 1, sectoral differences in transaction cost mark-ups do not matter for relative poverty, but in this model they are crucial. Due to the fact that domestic goods are not perfect substitutes with importables, a sectorally differential transaction cost shock alters relative prices across these categories of commodities, and triggers a series of additional effects on output levels, factors' allocation and rewards. A reduction of transaction costs lowers the wedge between demanded and supplied quantities of each commodity. Given the small country assumption, prices of "M" and of "X" do not change and, for these markets, the new equilibrium is reached via changes in export and import flows. Conversely,

commodity D's price is endogenous and is reduced. In turn, a falling price results into lower profitability for this sector and gives rise to resources reallocation. Finally, a reduction in wages of skilled workers is due to the more intensive use of this factor in the production of commodity D with respect to the other sectors.

The second experiment is *experiment 2*: "50 per cent reduction of exogenous transaction costs in factors markets for all factors and all agents." Table 9 shows the results for this experiment conducted with a slightly modified model 3 where transaction costs wedges have been introduced in factor markets. The results are self-explanatory: no relative (good or factor) price is altered, but simply less primary resources are used in transaction costs, so that the economy gains in a way that is identical to an increase in factor supplies. Results are the same when the experiment is conducted with model 1 or 2.

**Table 9. Basic Experiment of Reduction in Factor Transaction Costs,**  
percentage variations with respect to initial equilibrium – model 3

Percent variations	%		%
Output of X	9.1	HH demand of M	9.1
Output of D	9.1	HH demand of X	9.1
Price of M	0.0	HH demand of D	9.1
Price of X	0.0		
Price of D	0.0		
Exports	9.1		
Imports	9.1		
		Real HH income	9.1
Wage S	9.1		
Wage U	9.1		
Ratio $W_s / W_u$	0.0		

*Experiment 3* entails a factor-biased reduction of "50 per cent reduction of exogenous transaction costs in factors markets for skilled labour across all sectors."

**Table 10. Reduction in Factor (skilled L) Transaction Costs,**  
% variations with respect to initial equilibrium – model 3

Percent variations	%		%
Output of X	- 0.7	HH demand of M	- 1.7
Output of D	7.1	HH demand of X	- 0.4
	0.0	HH demand of D	7.1
Price of M		Consumer Price of M	0.0
Price of X	0.0	Consumer Price of X	0.0
Price of D	- 6.6	Consumer Price of D	- 6.6
Exports	- 1.7		
Imports	- 1.7	Real HH income	3.2
Wage S	- 5.0		
Wage U	2.7		
Ratio $W_s / W_u$	- 7.5		
X's Lab Dem of S	5.0	X's Lab Dem of U	- 1.7
D's Lab Dem of S	10.1	D's Lab Dem of U	3.1

Table 10 shows the results for this experiment conducted with model 3. As in the previous case these results can be interpreted as if there had been an increase in the



supply of skilled labour. Clearly, the largest beneficiaries of this windfall are producers in the domestic non-tradable sector, given that they use intensively a now more abundant factor. The production possibilities frontier shifts outwards and more so in direction of the skilled labour intensive product ("D"), and the relative (consumer) goods prices shifts in favour of this same product; producers supply more D thanks to the lower costs of employing skilled labour. The skilled wage premium is reduced and aggregate income rises (notice that skilled labour in volume is about 12 per cent of total employment).

The symmetric experiment of a biased reduction in unskilled labour transaction costs is summarised in Table 11. It should be emphasised that, as in the previous case, the increased supply effect (due to the reduction in transaction costs) dominates the wage-gap change: here, more abundant unskilled workers gain more in absolute terms but *less* relative to the scarcer skilled workers.

Table 11. **Reduction in Factor (unskilled L) Transaction Costs,**  
% variations with respect to initial equilibrium – model 3

Percent variations	%		%
Output of X	9.8	HH demand of M	10.9
Output of D	1.6	HH demand of X	9.4
	0.0	HH demand of D	1.6
Price of M	0.0	Consumer Price of M	0.0
Price of X	7.2	Consumer Price of X	0.0
Price of D	10.9	Consumer Price of D	7.2
Exports	10.9		
Imports		Real HH income	5.7
Wage S	14.5		
Wage U	6.0		
Ratio Ws / Wu	7.9		
X's Lab Dem of S	4.0	X's Lab Dem of U	11.0
D's Lab Dem of S	- 1.0	D's Lab Dem of U	5.7

*Experiment 4* entails a: "50 per cent reduction of tariffs with no change in transaction costs". Initially tariffs on importables are quite high at 46 per cent and their reduction makes imports cheaper relatively to domestically produced goods; this changes incentives for production and triggers resource reallocations.

Table 12. **Basic Experiment of Reduction in Tariffs,**  
percentage variations with respect to initial equilibrium – model 3

Percent variations	%		%
Output of X	2.0	HH demand of M	18.4
Output of D	- 1.8	HH demand of X	- 3.1
		HH demand of D	- 1.8
Price of M	0.0	Consumer Price of M	- 15.8
Price of X	0.0	Consumer Price of X	0.0
Price of D	- 2.2	Consumer Price of D	- 2.2
Exports	18.4		
Imports	18.4	Real HH income	0.9
Wage S	- 4.3		
Wage U	0.9		
Ratio Ws / Wu	-5.09		

Results shown in Table 12 are completely in line with traditional modelling of trade liberalisation, in particular it should be noticed that real income effects are quite small (less than 1 per cent), especially when compared with results obtained through a reduction in transaction costs.

With the aim of describing the recent evolution of the Indian economy, all the shocks previously examined are summarised in a final experiment. In this case, rather than assuming exogenous changes in transaction costs and measuring their effects on the Indian economy, the model "fits" the actual data and residually estimates transaction costs variations. More in detail, the model is calibrated on an initial equilibrium for 1988 and, by changing exogenous factors supplies, technological change, trade policy, terms of trade shocks, it is used to estimate a new 1994 equilibrium. The model results, in terms of GDP growth and wage gap, do not perfectly reproduce observed 1994 data and, at this stage, transaction costs are allowed to vary so that the model can correctly reproduce observations. In this way, the model provides an indirect estimate of the variation in transaction costs that ensures consistency with observed data.

Table 13 below shows the recent evolution of the Indian economy since it implemented its major structural reforms. The bottom panel shows a considerable spike (of almost two per cent per annum) in the growth rate of the sub-continent. Results shown in the previous experiment on trade liberalisation clearly show that a standard model cannot account for this sort of change in the growth rate: some additional structural change is taking place and need to be explicitly introduced in the model.

Table 13. **India – Recent Economic Evolution**

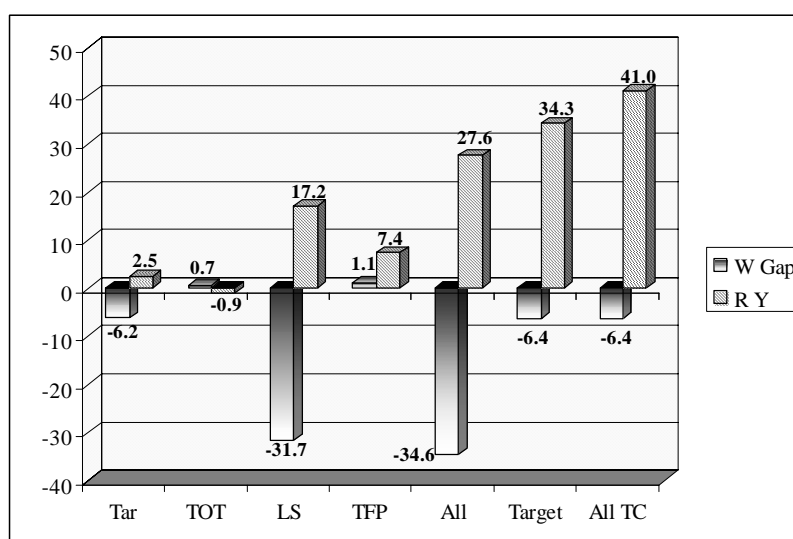
Variables / Periods	1988	1994	1988/1994 change
GDP constant 1988 price LCU (millions)	4 194 400	5 633 150	34.30
Wage Skilled	47.1	84.6	79.70
Wage Unskilled	18.8	36.1	91.92
Ratio (S / U)	2.5	2.3	- 6.36
Labour Skilled (millions)	29	39	34.18
Labour Unskilled (millions)	223	246	10.40
Tariff (average weighted in %)	87	46	- 47.13
TFP index (economy wide)	100	115	15.00
	1960-1987	1988-1999	
Average yearly GDP growth rate	3.88	5.69	

Initially the model is used to re-produce the 1994 equilibrium; in particular, four main exogenous changes are considered: *a)* change in tariff rates, *b)* terms of trade shock, *c)* changes in factor supplies, *d)* change in TFP (applied with no sector biases); then these four shocks are combined together.

The wage gap and GDP variations resulting from this set of experiments are shown in Figure 1. Tariff reduction decreases the wage gap by inducing resource re-allocation consistent with Indian comparative advantage and this has also a mild positive effect on real income; terms of trade shocks (consisting in a 10 per cent reduction of the price of Indian exportables) produce a minor increase in the wage gap accompanied by a

small real income reduction; changes in the labour supply of skilled and unskilled workers has major effects for both the wage gap and income, in particular skilled workers become relatively less scarce and their wage premium is considerably reduced; finally, technological progress has strong positive effects on real income and minor consequences for the wage gap. Combining all these shocks together produces the results shown in the column “All”. This compares quite well with column “Target”, which represents observed 1988-94 variations in the wage gap and real income, although the “model” wage gap seems to decrease much more than the “real world” wage gap, and, conversely, real incomes increase more in observed than model produced data.

Figure 1. **1988-94 Combined Shocks: Tariffs, Terms of Trade, Labour Supplies and TFP**



The right-most column shows the results for an experiment where transaction costs for the market of unskilled workers are allowed to change up to the point where the observed wage gap reduction is obtained. In this way, the model's wage gap perfectly matches the observed 6.4 per cent reduction and provides an indirect estimation for the reduction of transaction costs. These have to go down considerably by about 65 per cent. The size of this estimation should not be surprising, especially in the light of estimations of the costs of rent seeking in India. Rent seeking originating from price and quantity controls is indeed another way of looking at transaction costs, and it has been initially estimated by Krueger (1974) at 7 per cent of GNP and more recently by Mohammad and Whalley (1984) at 30-45 per cent of GNP.

## IV. CONCLUSIONS

The experiments discussed above show that different analytical structures highlight different transmission channels and can produce quite different final results.

From a static or long term equilibrium point of view, the debate on whether an improvement in transaction costs should benefit the poor seems essentially to be an empirical one. This paper's results though clearly show that transaction cost reductions can account for a large share of income changes normally recorded in internationally integrating economies, a novelty when contrasted with more traditional trade models. Clearly these conclusions echo very closely those reached when technology advances are modelled as productivity changes, and the transaction cost approach may indeed complement that of productivity. However, unless technology is modelled endogenously, a daunting task especially when developing countries are the object of study, a productivity shock represents a totally exogenous windfall, whereas a reduction in transaction costs feeds back in the models used here in a reduction of intermediation, and may be simpler to implement empirically. Notice also that, in the models examined here, transaction costs affects not only commodity exchanges, but also factors markets. In this way it is then possible to simulate changes in education, training, health, or even migration, that originate from lower transaction costs, and even larger numbers thus emerge.

## APPENDIX: POLICY-RELATED TRANSACTION COSTS IN INDIA

This appendix should be considered as a partial updating of the 1984 Mohammad and Whalley paper on rent seeking in India. In that paper, the authors estimate the cost of rent seeking in India and quantify its magnitude at between 30 and 45 per cent of GNP per year. They also offer an extensive survey of the numerous economic policies that are likely to cause rent seeking. It should be stressed that rent-seeking activity consists of using productive resources in “processes generating outputs with no welfare valuation”, i.e. consists of wasting resources, and, in this sense, rent seeking and *iceberg-melting* transaction costs are the same phenomenon.

In what follows, a brief sketch of the recent (1985-2001) evolution of the Indian economic policy controls is reported following the same headings of Mohammad and Whalley’s paper<sup>12</sup>.

### 1. External Sector Controls

#### 1.1. Import Restrictions

1985-1990

The 1980s saw some attempts to simplify the import licensing system in order to provide easier access to intermediate goods imports for domestic production by placing many such items on the readily importable OGL (Open General License) list. To a lesser extent capital goods imports were also eased through flexible operation of the discretionary regime in order to encourage technological upgrading, particularly for export-oriented industries.

There was some replacement of quantitative import restrictions by tariffs, primarily in cases where there was no competing domestic production.

The import tariff structure was somewhat simplified, however the average tariff rate went up.

In October 1986, duty-free imports of capital goods were allowed in selected “thrust” export industries.

In April 1988, access for exporters to imported capital goods was increased by widening the list of those available on OGL and by making some capital goods available selectively to exporters without going through “indigenous clearance”

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12. The following text draws heavily on the three sources cited at the end of the appendix.

### 1991-2001

In April 1992, a single negative list consisting of intermediate goods, a few capital goods and most consumer goods replaced import licensing.

For most goods other than final consumer goods, the reform in the very first year largely removed QRs (Quantitative Restrictions) on imports.

The QRs coverage for manufacturing (defined as the share of value added of the items subject to import licensing to total value added) declined from 90 per cent in the pre-reform period to 51 per cent in the 1994/95. It dropped to 29 per cent for capital goods and 35 per cent for raw materials and intermediates; more de-licensing has followed. Certain petroleum products are only major raw materials and intermediates whose import remains subject to licensing, and practice even licenses are not quantitatively restrictive.

Liberalisation for consumer goods started in 1992 when a large exporters received Special Import Licenses as an incentive, allowing them to import certain consumer goods specified on a positive list. These licenses are freely tradable and their premium accrues to exporters. The positive list has subsequently expanded. Baggage rules on consumer goods imports have also been liberalised.

A phased reduction in tariffs thus became a central component of trade policy reform as tariff rates came down in all the budgets presented from 1991 onwards, with the maximum tariff decreased to 50 per cent in March 1995. Systematic reduction in the dispersion of tariff rates produced eight rates of custom duty by April 1995 as opposed to 22 at the beginning of 1991. In 1992, the Tax Reform Committee recommended that, by 1997/98, the tariff structure should have custom duties of 20 per cent on capital goods, 25 to 30 per cent on intermediate goods and 50 per cent on consumer goods. The government accepted the recommendations with an open commitment to lower tariffs further.

Import duties on capital goods have dropped substantially. The composite rate on "project imports" (imports of various capital goods needed to set up new projects), fell to 25 per cent from 85 per cent. The duty on imports of machinery for electricity generation, petroleum refining, and coal mining came down to 20 per cent; that for fertilisers dropped to zero. The authorities left in place an earlier facility for duty-free imports of capital goods by firms registered under the 100 per cent Export-Oriented Units (EOU) scheme and those in Export Processing Zones (EPZs).

Intermediates goods such as metals and chemicals also obtained substantial tariff reductions.

Effective tariff protection for manufacturing has fallen from an estimated 164 per cent in fiscal year 1990/91 to about 72 per cent in 1994/95.

The most recent 2001-02 official trade policy review (Exim policy) considers the following points: *a)* QRs are totally dismantled; *b)* standing group to be set up for monitoring import of 300 sensitive items; *c)* import of new and second hand automobiles allowed, but subject to conditions; *d)* import of agricultural products like wheat, rice, maize, other coarse cereals, copra and coconut oil has been placed in the category of state trading; *e)* free imports of second hand capital goods from up to 10 years old.

## **1.2. Foreign Exchange Rationing**

*1985-1990*

Since Indian inflation rose faster than that of its trading partners, a devaluation of the nominal effective exchange rate of about 45 per cent was required and achieved. This reflects a considerable change in the official attitude toward exchange rate depreciation, however stringent restrictions still apply to foreign exchange trades.

*1991-2001*

The rupee was devalued in July 1991 by 24 per cent. Exchange-rate policy went through a series of further changes from 1991 to 1993. In March 1992 a dual exchange-rate system was introduced. Under the new regime, exporters surrendered 40 per cent of their foreign exchange earnings to the Reserve Bank of India at the official exchange rate, retaining the remaining 60 per cent for sale in the free market thus created, which automatically restricted import demand to the available foreign exchange.

In March 1993, the government moved to a unified floating exchange rate. The exchange rate settled at around Rs 31=\$1, between the old exchange rate of Rs 24=\$1 and the free-market rate of Rs 34=\$1. Thus, the nominal exchange rate shifted by 57.5 per cent, from Rs 20=\$1 in June 1991 before the devaluation to Rs 31.5=\$1 in March 1993.

The rupee is now fully convertible for current-account transaction.

## **1.3. Export Controls and Export Promotion**

*1985-1990*

Export incentives were substantially increased. Cash assistance and duty drawbacks went up. The value of the incentives net of taxes increased from 2.3 per cent of the value of exports in 1960/61 to 11.1 per cent in 1989/90.

There was a widening of the coverage of products available to exporters against import replenishment and advance licenses. Very substantial income tax concessions were given to business profits attributable to exports. The traditional export subsidies (cash assistance, premium on import replenishment licenses, and duty drawbacks) increased from 9 to 13 per cent of total export.

In 1985 budget, 50 per cent of business profits attributable to exports were made income tax exempt: in the 1988 budget this concession was extended to 100 per cent of the export profits.

The interest rate on export credit was reduced from 12 to 9 per cent.

### *1991-2001*

Reduced exports subsidies. With the removal of quantitative restrictions and a shift to a new competitive exchange rate, a large part of the export subsidy regime was dismantled.

Cash compensatory support ended very early when the rupee was devalued by 24 per cent in July 1991. Subsequently the International Price Reimbursement Scheme (IPRS), which refunded to the user the difference between the world and domestic prices of major inputs such as steel and rubber, was abolished from 31 March 1994.

The major still present export incentives include duty drawback and the advance licensing scheme to large exporters to import the needed inputs duty free. The EPZs and the scheme of EOUs also continue. The Exim Policy of April 1995 has taken several steps to enhance export incentives, e.g. provision for duty-free importation of capital goods and extension of the EPCG scheme to the services sector; improvement in the Advance Licensing Scheme; an introduction of a green channel facility for customs clearance by certain categories of exporters.

## **2. Capital Markets Controls**

### ***2.1. Industrial Licensing***

#### *1985-1990*

There was some dilution of external requirements as regards entry and expansion of capacity. The list of industries open to large firms was extended, and the licensing procedure has been simplified.

#### *1991-2001*

Restrictions on the operation of large industrial houses have been removed. Licensing requirements for investment have been abolished for all except a few strategic and defence industries. Many areas earlier reserved for the public sector are now open to private entrepreneurs.

These measures resulted into a strong injection of domestic competition and market orientation in the manufacturing industry.

It should be noticed that considerable resistance to reforms arises from public-sector infrastructure monopolies. Thus, even though doors have been opened for both foreign and domestic private investment into these sectors, actual progress has been slow.

The Statement of Industrial Policy 1991 reduced the list reserved for the public sector from 17 to eight. By the end of 1994, the only areas in manufacturing which continued to be reserved to public firms were those related to defence, strategic concerns, and petroleum. Even here the government may invite the private sector to participate, as it has in the case of oil exploration and refining.



## **2.2. Banks and Insurance Companies Controls**

1991-2001

India's economic reforms have extended to both the banking system and the capital markets. To reduce the former dominance of the financial sector by public-sector banks with little commercial discretion in allocating their lending, banking sector reforms have included substantial interest rate deregulation, more liberal licensing of private-sector bank, and more latitude for expansion of the branch networks of foreign banks. The issue of privatisation of the public-sector banks has not yet been addressed.

Capital-market reforms have sought to free capital market from detailed, direct government controls, replacing them by a system of supervision to ensure better disclosure, greater transparency and thus more investor protection. Efforts are being made to modernise the stock exchanges and improve trading practices and settlement systems. A major current initiative is the introduction of legislation to establish a Central Depository System, which would expedite settlement.

There have been no reforms in the insurance sector; an expert committee has recommended opening it to private investment, including foreign investment, but no decision has yet been taken.

## **2.3. Controls on Foreign Private Investment**

1985-1990

In the second half of the 1980s, government began to seek foreign investment in industries deemed to be of the national importance.

1991-2001

Reforms in policy towards foreign investment began with a radically new approach to Foreign Direct Investment (FDI) in the first year of the reforms. The new regime permits FDI in virtually every sector of the economy. Foreign-equity proposals need not be accompanied by technology transfers as required earlier. Royalty payments have been considerably liberalised. In industries reserved for the small-scale sector foreign equity can go up to 24 per cent. Policy encourages foreign equity up to 100 per cent in export-oriented units, the power sector, electronics and software technology parks. In other industries, foreign equity up to 100 per cent permitted discretionally. No restrictions hinder the use of foreign brand names/trade marks for internal sale.

Although simplified, controls remain. A simple fast-track mechanism or "automatic approval" from the Reserve Bank of India is available for projects of certain kinds, e.g. up to 51 per cent equity in high priority industries, up to 100 per cent equity in wholly export-oriented units and all foreign-technology agreements, which meet certain economic parameters. For all others, including cases involving foreign-equity participation of over 51 per cent, a high-level Foreign Investment Promotion Board (FIPB) reviews the applications. About 20 per cent of the proposals have gone through the automatic route.

The Foreign Exchange Regulation Act (FERA) has undergone substantial amendment to remove restrictive provisions on the operations of companies with foreign equity of 40 per cent or more (commonly known as FERA companies). All companies incorporated in India are now treated alike irrespective of the level of foreign equity. FERA companies can now acquire and sell immovable property. They can also borrow and accept deposits from the public. Raising equity up to 51 per cent for these companies receives "automatic approval", if the investment are in any of 35 listed priority industries.

India has joined the Multilateral Investment Guarantee Agency (MIGA) for protecting foreign investment against risks such as war, civil disturbance and expropriation.

The government specially encourages foreign investment in infrastructure, particularly the power sector. Not only can foreign investor hold 100 per cent equity, but tax holidays are also offered for five years for new power projects.

In the hydrocarbon sector, joint ventures are now permitted in both exploration and development of oil fields and refineries. The telecommunication sector opened up with the announcement in May 1994 of a new telecom policy providing for private investment in basic telephone services as well as value-added services.

Air transport, until recently a public-sector monopoly, has opened to private sector, and new entrants have begun operations. Private toll roads have also been commissioned.

In 1992 the government announced a new policy encouraging *portfolio investment* in Indian industry. The Indian capital markets thus opened to foreign institutional investors such as pension funds and broad-based mutual funds, subject to regulation by the Securities and Exchange Board of India. Indian companies also gained access to capital markets abroad through mechanisms such as Global Depository Receipts or Euro issues.

Substantially reduced restrictions on foreign investment produced an inflow of portfolio investment that has grown from practically nil before 1991 to almost \$3.5 billion per year since fiscal year 1993/94, while direct investment grew to over \$1.3 billion by 1994/95.

Outflows by residents are still forbidden or highly controlled. Inflows and outflows by non-residents, have been partially deregulated. Foreign portfolio investment by residents is forbidden.

## **2.4. Interest Rates Controls**

1991-2001

Interest rate deregulation has been much faster since 1991. The process of liberalisation has gone forward in commercial-bank deposit and loan rates. As recently as 1989/90, the interest rate structure was still very complicated with 50 lending categories and a large number of stipulated interest rates depending on loan size, usage and type of borrower. Starting in April 1992, the structure has become much freer and

simpler. By the end of 1993, there were only two restrictions on deposit rates: a fixed rate on savings deposits of 5 per cent and a maximum rate of 10 per cent on term deposits (defined as deposits with maturities above one and a half months). On the lending side, there was a minimum lending rate of 15 per cent for loans above Rs 2 lakhs and a concessional rate of 12 per cent for very small loans. Since then, there has been further deregulation. The lending rate for loans larger than Rs 2 lakhs has been totally freed, though two concessional rates (13.5 per cent and 12 per cent) are now in place for loans of smaller size. The cap on the deposit rate (now 12 per cent) applies only to maturities of one and a half months to two years; the deposit rate for deposits longer than two years is unrestricted.

## **2.5. Monopoly Controls**

*1985-1990*

The asset threshold above which firms are subject to monopoly regulation was raised. Softening of restrictions on monopolies.

## **3. Controls in Goods Markets**

### **3.1. Price Controls**

*1985-1990*

Though this form of intervention has been diluted, its scope nevertheless remains intensive. The wholesale price index consists of a total of 360 commodities of which there are 55 major items whose prices are fully administered, partially administered or subjected to different forms of voluntary and other mechanisms of control. Fully administered items include petroleum products, coal, electricity, fertilisers, iron and steel products, non-ferrous metals, drugs and medicines, paper and newsprint.

### **3.2 Pricing and Public Enterprises**

*1991-2001*

Budgetary support to public enterprises has been reduced. India's infrastructure has not fared well in the reform process. Market-orientation and domestic deregulation have focussed largely on the manufacturing sector, while crucial areas of infrastructure like power generation, telecommunications, roads and ports still function within a maze of regulation.

### **3.3. Controls on Agriculture**

*1991-2001*

The prices of all major agricultural products have been largely determined by the central government's control of foreign trade in them. The prices of cereals (rice, wheat,

and coarse grains) and cotton have been held below world prices in most years by controlling exports.

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