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The Terms-of-Trade Effects from the Elimination of State Trading in Soviet-Hungarian Trade

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and
David Tarr

A reduction of the Soviet "subsidy" to Eastern European countries would impose greater transition costs on them just as they are attempting to make the drastic adjustments they need to move to market economies. How much of a cost will the switchover of their CMEA trade relations impose?

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This paper — a joint product of the Trade, Finance, and Public Sector Division, Technical Department, Europe, Middle East, and North Africa Regional Office and the Socialist Economies Reform Unit, Country Economics Department — is part of a larger effort in PRE to examine the role of trade liberalization in the transition from a socialist to a market economy. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Joe Smith, room H9-071, extension 37350 (30 pages).

Economists have debated whether the Soviet Union subsidized trade with its Eastern European partners in the Council of Mutual Economic Assistance (CMEA).

Effective January 1, 1991, former CMEA members implemented their "switchover" decision to convert to world market prices denominated in convertible currency. The switchover dramatically reduced the role of "state trading" by permitting direct enterprise to enterprise transactions denominated and settled in convertible currency.

Oblath and Tarr made an intensive study of the trading relationship between Hungary and the Soviet Union as a case study on the terms-of-trade issue.

A detailed empirical investigation of prices in Soviet-Hungarian trade before and after the switchover provides some indication of the terms-of-trade loss that Hungary is likely to suffer as a result of the switchover of its trading relationship with the Soviet Union.

Based on the assumption that oil would sell at about \$21 a barrel, Hungary probably will suffer an income terms-of-trade loss of \$1.5 billion to \$2.15 billion, more than double the most recently published careful estimate. In view of the volatile price of oil on world markets, however, the study estimates that for each dollar change in the world price of oil, all energy costs would change by \$76 million.

Contrary to conventional wisdom, Oblath and Tarr find that the majority of Hungarian firms exporting to the Soviet Union have been disfavored by the combination of the payments mechanism, exchange rate, tax, and subsidy policies.

The experience of early 1991 suggests that a significant decline is likely to occur in Soviet imports from Hungary during the remainder of the year. A variety of problems account for the decline, many of them specific to internal conditions in the Soviet Union.

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**The Terms-of-Trade Effects from the Elimination
of State Trading in Soviet-Hungarian Trade**

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THE TERMS-OF-TRADE EFFECTS FROM THE ELIMINATION OF STATE TRADING IN SOVIET-HUNGARIAN TRADE

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Whether the Soviet Union subsidized the trade with its Eastern European partners in the Council of Mutual Economic Assistance (CMEA) has been a matter of considerable debate. As of January 1, 1991, the now former CMEA countries implemented their decision (taken at the CMEA meetings in Sofia during January 1990) to convert to world market prices denominated in convertible currency in the CMEA (called the "switch-over");² thus, the issue has become one of great practical importance to the Eastern European countries who formerly comprised the CMEA. A reduction in the Soviet "subsidy" would impose greater transition costs on their economies, due to the loss of real income it entails, at a time when these economies are already burdened with heavy transition costs as they struggle to create market economies.

This paper contributes to this literature in five important ways: (1) We

¹The views expressed are those of the authors and do not necessarily reflect the views of the World bank or Kopint Datorg.

²The practical means through which this has been accomplished is by negotiation at the enterprise to enterprise level, with payment in convertible currencies, i.e., by dramatically reducing the role of the state in trading. As explained in World Bank (1991), world market prices for products such as machinery will not, in general, be determined through intergovernmental negotiation.

provide an update of the estimate for Hungary. Previous estimates have indicated that the Soviet subsidy changed significantly from year to year, and our estimate of the Soviet subsidy is more than double the Marrese-Wittenberg estimate for 1987; (2) We introduce a new data set which is based on our extensive interview survey of experts in important Hungarian enterprises who engage in trade with the Soviet Union; the frequently cited estimates of Marrese-Vanous (1983), which were based on unit values, have been criticized for excessive adjustment for quality. We believe that our method, which implicitly adjusts for quality based on the expert opinion, is at least as reliable; (3) we analyze the previously unnoted methodological question of how to assess the terms-of-trade change for the Eastern European countries who have trade surpluses in TR. There is a problem in assessing the terms-of-trade change, given that in 1989 and 1990, all Eastern European CMEA countries except Romania had a surplus with the Soviet Union denominated in an inconvertible unit of account, the transferable rouble (TR);³ (4) we show that contrary to the conventional wisdom on the subject, the majority of Hungarian firms exporting to the Soviet Union have been disfavored by the combination of the payments mechanism and exchange rate, tax and subsidy policies; and (5) we compare and evaluate the methodology of other recent estimates of the terms-of-trade loss due to the switch-over in Eastern Europe.

Based on data for 1988, 1989 and 1990, this paper presents estimates that Hungary will suffer a terms-of-trade loss as a result of the switch-over to hard currency pricing with the Soviet Union in 1991. The estimate is presented using two measures: the loss of income to Hungary (the income terms-of-trade) and the

³The uncertain settlement of the TR balance between the Soviet Union and Hungary is described below.

change in the relative prices of Hungary in its bilateral trade with the Soviet Union (what we call the bilateral commodity or barter terms-of-trade).⁴ The estimate of the income loss is that, based on 1988 or 1989 quantities and prices, Hungary would have lost between \$0.8 billion and \$1.2 billion as a result of the switch-over. Regarding the price effect, it is estimated that Hungary would suffer an adverse impact in the prices at which it trades with the Soviet Union of between 17 and 24 percent.

The upper and lower bounds of the estimates derive from the following extreme assumptions, which are elaborated in more detail in section 3. If the TR surpluses were unredeemable and worthless, then there will be less terms-of-trade shock to Hungary because Hungary's terms-of-trade are less favorable in its CMEA trade than TR pricing implies; then the lower estimates of the terms-of-trade loss are appropriate. If the TR surpluses are fully redeemable at the TR prices of imports prevailing in CMEA trade, then the terms-of-trade of Hungary are more favorable in its CMEA trade, there will be a larger terms-of-trade loss to Hungary and the larger estimates are appropriate.

Updating for the effects of the developments in the energy sectors as of early 1991 results in an estimated income loss to Hungary of between \$1.5 and \$2.15 billion, an estimate which again depends on a methodological assumption, discussed below. The estimates are based on an assumed oil price of \$21 per barrel. In view of the volatile price of oil on world markets, however, we also estimate that for each dollar change in the price of oil on world markets, all

⁴The difference between the bilateral commodity terms-of-trade (as used in this paper) and the commodity terms-of-trade [as used in the literature, see Salvatore (1987)], is that the former relates to foreign trade price changes with a single country only. The impact of a change in the bilateral commodity terms-of-trade on the overall commodity terms-of-trade is given by weighting the change in the bilateral commodity terms-of-trade by the share of trade with the particular country in overall trade.

energy costs would change by \$76 million. Consequently, the reader may calculate the impact of a price change in oil on the switch-over costs for any assumed price of oil⁴. The estimates are summarized in table 2.

We begin in section 1 with a brief overview of the literature on the Soviet subsidy of trade in the CMEA. In section 2 and in the mathematical appendix, we discuss the principal methodological questions in evaluating the costs of the switch-over. Our results are presented in section 3. In section 4, we compare our estimates with other recent estimates, and also provide estimates of the impact of the switch-over at the sector level. Mathematical derivations and explanations of the data sources are presented in the appendices.

1. THE LITERATURE ON THE SOVIET SUBSIDIZATION OF EASTERN EUROPEAN TRADE⁵

Traditionally it was assumed that the Soviet Union exercised political and military power to exploit its CMEA partners through terms-of-trade favorable to itself (Holzman, 1985). In their extremely influential contribution, Marrese and Vanous (1983) reversed this presumption. They argued that the Soviet Union was selling "hard" goods (fuel and raw materials) to its CMEA partners in return for "soft" goods (most notably machinery) at terms-of-trade very unfavorable to the Soviet Union when proper account is taken for the low quality of the Eastern European goods. They estimated that the average annual loss to the Soviet Union rose from \$248 million in 1960 to \$2840 million in 1978. Marrese and Wittenberg (1990) have updated the Marrese and Vanous estimates for Hungary; they estimate that the Soviet subsidy of Hungary was \$4.2-\$4.4 billion for 1982 and \$250-\$530 million for 1987, with a fall in the price of oil accounting for 80 percent of

⁴This discussion of this section draws on the discussion by Balassa (1990).

the decline in the subsidy.

Marer (1984) criticized the Marrese-Vanous estimate for using excessive discounts for quality in the calculations,⁶ and for failing to take into account that Eastern European type equipment is often specially designed for the Soviet market and may not be available in the West.⁷ Thus, although the Eastern European equipment may be perfectly adequate for the Soviet market, it may be forced to sell at large discounts if marketed in the West, and it was these Western discounts which formed the basis of the Marrese-Vanous calculations. As discussed below, however, the basic Marrese-Vanous results have been replicated by a number of authors; as a result, by the late 1980s a static terms-of-trade loss to the Soviet Union from its trade with Eastern Europe was the conventional wisdom.

Whether the Soviet Union "subsidized" Eastern Europe is a broader question. Erada (1985) and Koves (1983) noted that the obligation to provide the Soviet Union with machinery products in a rigid state controlled framework provides little incentive for quality improvement or innovation. Thus, there were almost certainly dynamic efficiency losses involved in the system. Balassa (1990) commented that the CMEA countries provision of capital for joint projects, such as pipelines, at an interest rate of about 2 percent was a subsidy by Eastern Europe to the Soviet Union, given that Euromarket rate. 9-10 percent prevailed

⁶The actual way in which Marrese-Vanous and Marrese-Wittenberg (1989) determined the world market price of a product was by selecting a Western market where a product of comparable quality, in their judgement, was sold.

⁷An example would be railroad cars from the former East Germany, which are built to the special gauge of the tracks in the Soviet Union, and replacement parts for a network of 10 year old Soviet computers, which are supplied by Videoton in Hungary.

and convertible currency was used extensively in the provision of credit.⁶ We also note that what is of paramount importance is that socialist economic systems were imposed on most of the countries of Eastern Europe in the post-World War II era by the Soviet Union. Were it not for this Soviet imposition and continued control, many of the economies would almost certainly have become market economies integrated into the Western industrial trading system with standards of living comparable to that of their neighboring countries in Western Europe, i.e., many multiples of their present levels. Thus, when we discuss the Soviet subsidization of Eastern Europe it must clearly be in some very limited context, which ignores the dramatic overall income reducing influence of the historical Soviet presence.

Marrese and Vanous contended that the Soviet Union subsidized Eastern Europe in order to obtain political and military allegiance. Brada (1988) noted, however, that the populations of the Eastern European countries were not providing the sought after allegiance, for the populations objected to the loss of sovereignty; and the leaders of the former Communist regimes found Soviet control in their own self interest, as is evident from the dramatic political upheaval that occurred in all six Eastern European CMEA countries in 1989 accompanying the decline in the Soviet presence. Moreover, deviations from the prescribed Soviet path were suppressed in Hungary and Czechoslovakia by military means. Thus, the rationale for Soviet subsidies is not clearly articulated, because it appears that the subsidization bought little support, and the

⁶In addition, components of the projects supplied by Eastern European countries (purchased in US dollars) were credited in TR at the official Soviet exchange rate between the US dollar and the TR which overvalued the TR.

subservience was obtainable through military means.⁶

In view of the arguments on the dynamic inefficiencies entailed in the CMEA trading arrangement, the Eastern European subsidies of a number of capital projects and the long run impact of the Soviet presence, we avoid discussion of the overall Soviet subsidization issue; rather we confine ourselves to a narrower subject of the static terms-of-trade loss of the switch-over, which we estimate for Hungary alone. We shall, however, interchangeably use the term "subsidy" to be understood in this very limited sense.

2. THE METHODOLOGY

Overview of the Methodology

The methodology is elaborated in detail in two appendices. In appendix 1, information on the sample, as well a number of technical details related to table 1 are discussed. Appendix 2 provides mathematical derivations of the formulas employed, demonstrates that our approach is independent of the use of exchange rates (which are necessarily arbitrary) as well as further insight into comparisons of our approach to others. An overview of the essential features, however, is provided here. Representative products of major exporting and importing branches were selected and both objective data and expert opinion were used for estimating what the potential dollar prices of these products would be

⁶Holzman (1986) and Brada (1985, 1988) argued that market segmentation in the CMEA explained the pattern of prices, and that relative prices within the Eastern European CMEA members reflected the same relative prices between the CMEA members and the Soviet Union (referred to as the customs union theory of CMEA pricing). In particular, net exporters of fuel and raw materials would be subsidy givers within the CMEA. Since Poland, which has better resource endowment than Hungary, and is a net exporter of energy and net importer of manufactured goods, Marrese-Wittenberg tested this proposition by comparing Polish and Soviet subsidies to Hungary. They find mixed evidence for the customs union theory of CMEA pricing: in 1982 Poland subsidized Hungary, but in 1987 the evidence seems to support an interpretation of Hungarian subsidies to Poland.

if they were traded in hard currency with the Soviet Union. By objective data we mean that for homogeneous products, such as oil and raw materials, a world market price was known from international commodity market quotations. For manufactured goods however, this approach was not possible because of the great variation in product quality. Therefore, for heterogeneous products, expert opinion was sought. In these cases, individuals from foreign trade organizations and manufacturing firms who were most likely to have the best information were requested to give an estimate. In all cases where expert opinion was sought an in depth interview was performed. Based on their knowledge of the prices of similar products on the world market on the one hand, and on conditions in the Soviet market on the other, they were asked to estimate the prices their exports could fetch or what they would have to pay for imports, if they were priced and paid for in US dollars in trade with the Soviet Union. The survey was conducted for the year 1988.

As we discuss below, given the importance of the terms-of-trade costs of the switch-over to the Eastern European economies, a number of researchers have attempted to estimate the terms-of-trade costs of the switch-over on the basis of somewhat aggregate unit value data. Without a detailed microeconomic investigation, however, these estimates, while useful, can only be viewed as illustrative. The serious alternative approach to ours is to compare unit values at a somewhat disaggregated level, compiled from foreign trade statistics -- the approach adopted by Gacs (1989) and Marrese-Wittenberg (1990). These researchers must either choose representative markets as Marrese-Wittenberg, or choose a quality adjustment coefficient. Relying on a small team of researchers to make adjustments for product quality for literally hundreds of products about which their expertise is somewhat limited presents problems that are at least

as large if not greater than those in this approach. Thus, although this approach has several limitations which are discussed in the appendix, we believe it should be viewed as at least as good as any of the alternatives.

It should be noted that a significant advantage of the approach in this paper is that it avoids conversions through exchange rates between roubles, dollars and forints. This fact is demonstrated in the appendix. Given the fact that the forint/rouble and rouble/dollar exchange rates are not market determined, it is desirable to avoid any conversion based on exchange rates and the arbitrariness that involves.

3. THE RESULTS

The Change in the Income terms-of-trade

The first measure discussed is the income terms-of-trade loss to Hungary of the switch-over. The basic data are presented in table 1. Based on 1988 quantity weights and on the price information for that year, the summary data are presented in column 7. An explanation of the other columns is presented in the appendix. Column 7 indicates the value Hungarian exports would earn in dollars and the value Hungarians would have to pay in dollars for imports at world market prices in 1988. Take machinery exports as an example. If the same quantity of Hungarian machinery exports to the Soviet Union were sold at world market prices estimated to prevail in 1988, the expected value of the earnings is \$2.15 billion as opposed to 2.83 billion TR. If all exports were sold in dollars the expected earnings are \$4.1 billion, and if all imports were paid for in dollars, the expected value of Hungarian payments is \$4.9 billion. Thus, the difference of \$0.8 billion is the expected value of the additional dollars that Hungary would have to pay as a result of the switch-over.

In order to arrive at an estimate of the income terms-of-trade loss, it is necessary to decide how to value the TR surplus that existed in 1988. One can note from Table 1 that Hungary had a surplus in its bilateral merchandise trade with the Soviet Union of 0.4 billion TR in 1988. The surplus was about the same in 1989, but rose to over 0.6 billion TR in 1990.

One extreme is to assume that the TR surpluses are valueless, i.e., that the export and import bundle of goods was the best deal that Hungary could negotiate with the Soviet Union, and Hungary would never receive any compensation in goods or services for these surpluses. Then \$0.8 billion is the estimate of the income terms-of-trade loss, because it values the TR surpluses at zero.

At the other extreme is to assume that the TR surpluses would have been redeemable in full for goods and services from the Soviet Union at relative prices for imports prevailing in 1988. Under this assumption it is necessary to assign a dollar value to the TR surplus at the relative prices that prevailed in 1988. This is appropriately done by counterfactually reducing the vector of export quantities and increasing the vector of import quantities equiproportionately such that trade is balanced in TR. Assessing the total dollar value of these counterfactually produced vectors of exports and imports yields an expected value for the dollar loss from the switch-over of \$1.23 billion.¹⁰

Which of these estimates is closer to being correct? The great uncertainty, which prevailed in 1989 and early 1990, of if and when the TR surpluses would be exchanged for goods in the future suggests that the TR surpluses were not valued in full at the relative prices prevailing in 1988, so the estimate \$1.23

¹⁰Hungary's bilateral trade balance with the Soviet Union is likely to be negative in 1991. Since we are estimating terms-of-trade effects, we ignore quantity effects which would affect the trade balance.

billion is too high. This uncertainty contributed to the system of licensing Hungarian exports to the Soviet Union in early 1990. On the other hand, the settlement of the Hungarian-Soviet Union TR balance appeared to be resolved with the agreement to convert Hungary's accumulated TR surplus with the Soviet Union into a dollar amount to be used for the purchase of Soviet goods or to finance a bilateral trade deficit at the rate of \$0.92 = 1 TR. This indicated that the TR surpluses have value, and the estimate of \$0.8 billion is too low. The Soviet Union, however, has presented some counter claims against Hungary (for example, for improvements to buildings its departing military is leaving behind), and, more importantly, the time period over which these surpluses could be redeemed remained unresolved as of March 1991; the Hungarian government wanted a one year period and the Soviet Union a five year period. If a five year period were agreed, then the surpluses would have to be discounted significantly.

The Change in the Bilateral Commodity terms-of-trade

The counterpart to the income loss from a terms-of-trade change is the change in prices, which is naturally based on the commodity terms-of-trade, i.e., an index of the price of exports divided by an index of the price of imports. Given the importance of the Soviet trade for Hungary, we define such indices with respect to the Soviet Union alone. The percentage change in the ratio of the price index of exports to the price index of imports in the Soviet Union-Hungarian trade we define as the percentage change in the bilateral commodity terms-of-trade.

Similar to the calculations regarding the income terms-of-trade we must make an assumption regarding how to value the trade surpluses with the Soviet Union. Again, at one extreme is the assumption that they are valued in full at

the relative prices in TR prevailing in 1988, i.e., that Hungary would be able to convert its TR surpluses with the Soviet Union into imports from the Soviet Union at the TR prices prevailing in 1988. In that case the TR prices that prevailed in 1988 are the relevant prices for defining the price index in 1988, and the estimated dollar prices are relevant for defining the price indices after the switch-over. We show in the appendix that based on 1988 initial data, the change in the bilateral commodity terms-of-trade is the ratio of the weighted average export relative price (.864) to the weighted average import relative price (1.134) or 0.762. That is, the terms-of-trade would shift adversely for Hungary by almost 24 percent.

The other extreme is to assume that the TR surpluses were valueless. In this case the TR prices are not the relevant prices with which to construct the price indices, because they are not the prices at which Hungary can import. The appropriate TR prices would be the counterfactually created TR price vectors where export prices are reduced and import prices are increased equiproportionately such that there is no trade surplus in TR. This means that the true terms-of-trade under the protocols in 1988 are worse than the terms-of-trade based on unadjusted TR prices; consequently the switch-over would cause less of an adverse effect on the terms-of-trade. Making this adjustment, it is necessary to decrease TR export prices and increase import prices in TR by 4.5 percent in order to create a zero trade balance in TR with fixed quantities. Then the change in the terms-of-trade is reduced to 17 percent. This is obtained from the ratio of the counterfactually created export relative price index of .901 to the import relative price index of 1.083, which is .832.

Thus, we estimate that had the switch-over occurred in 1988, the bilateral commodity terms-of-trade with the Soviet Union would have moved adversely against

Hungary between 17 and 24 percent.

Adjusting the Estimates of the Switch-Over Costs for Changes in the Energy Sector

Due to volatility in the price of energy products it is useful to update the estimates for energy price changes; these are presented in table 2. Based on dollar prices that prevailed in February 1991 and TR prices in 1990, the relative price in the mining sector would increase to 1.39 and the relative price in the electricity sector would increase to 1.57.¹¹ Though the relative prices for other industries (product groups) might also have changed, there is no information of any comparably important change in the relative price of other industries as that of energy products. Using 1990 quantity weights, results in an estimate of an additional cost to Hungary of the switch-over of \$700 million (for a total cost of between 1.5 and 1.9 billion dollars), and an additional adverse movement in the bilateral terms-of-trade of 13 percent (for a total adverse movement of between 30 and 37 percent).

There is a methodological question regarding whether 1988 or 1990 quantity weights would be most appropriate. Since the volume of trade between the Soviet Union and Hungary declined by about 30 percent in 1990 relative to 1988 or 1989, the choice between 1990 and either of the previous two years is significant. One view is that one should use 1990 quantity weights if 1990 prices are being employed. To assess the "subsidy" that Hungary actually received from the Soviet

¹¹We assume a price of \$21 per barrel (and 7.4 barrels per metric ton), which is based on the spot price of a barrel of oil during early February 1991. The relative prices of natural gas, coal and electricity are calculated on the basis of TR prices of 1990 and actual contractual prices between Hungary and the Soviet Union during early 1991. The increase in the relative price also derives from a decrease in the TR price of oil between 1988 and 1990 (from 133 to 96 TR per metric ton of oil), due to the 5 year moving average Bucharest formula.

Union in 1990, this would be the correct procedure. Another view is that the Soviet Union cut deliveries to Hungary of oil in 1990 to force Hungary to incur some of the switch-over costs in 1990. That is, if the Soviet Union had a continued commitment to the CMEA system, it would have made an effort to maintain deliveries to the CMEA partners, rather than sell to the West for convertible currency.¹² Then one could counterfactually evaluate what the Soviet "subsidy" to Hungary would have been in 1990, if it had maintained deliveries in 1990 at the level of 1988. Using 1988 quantities and the prices of the previous paragraph, results in an additional cost of the switch-over of \$950 million (for a total cost of between 1.75 and 2.15 billion dollars).

Since the prices of energy products are subject to considerable volatility, we also estimate the change in the Soviet "subsidy" to Hungary for each dollar change in the price of oil (taking into account the impact of a change in the price of oil on other energy products). Based on 1990 quantity weights, we estimate that the switch-over costs to Hungary will change by \$76 million for each dollar change in the price of a barrel of oil.¹³ Using this estimate of the subsidy per dollar per barrel, the reader may easily calculate the change in the

¹²Of course, part of the reason for the cut in Soviet deliveries to Eastern Europe was domestic production problems. But, deliveries of oil to Eastern Europe fell more than in proportion to the drop in production or in sales to the West.

¹³The estimate is derived using the following methodology. In 1990 Hungary imported 32.9 million barrels of oil from the Soviet Union. Thus, a one dollar increase in the price of oil will increase the cost of oil from the Soviet Union by \$32.9 million. In addition, a one dollar increase in the price of oil is estimated to increase the cost of non-oil energy imports by \$43 million. The latter number is derived from the fact that non-oil energy imports represented 67 percent of the total value of Hungarian energy imports from the Soviet Union in 1990, and Hungarian government and industry sources estimate that the proportional increase in non-oil energy costs will be 65 percent of the proportional increase in the cost of oil, i.e., \$43 million - \$32.9 million*(67/33)*(.65).

Soviet subsidy to Hungary for any estimated future price of a barrel of oil.¹⁴

4. COMPARISON WITH OTHER ESTIMATES

The Price of Hungarian Exports

Before comparing our estimates to others, we first discuss some data that will be useful in assessing other estimates. Despite the fact that Hungarian exports are of lower quality than Western products, our investigation, summarized in table 3, finds that Hungarian exporters would have been able to obtain considerably more in domestic currency by selling for convertible currency in the Soviet Union than by selling in transferable roubles.¹⁵ In column 3 of the export section of the table, one can observe (by sector) the number of forint an untaxed Hungarian exporter (or importer) is expected to earn (pay) by exporting and selling for dollars compared to transferable roubles. For the exporting enterprise itself, its incentives are dependent on the system of trade taxes and subsidies. In column 6, we note that all sectors except the food processing industry expected to earn more in domestic currency after the switch-over.¹⁶ These data show that the microeconomic incentives to Hungarian

¹⁴As mentioned above, part of the increased switch-over costs attributable to using updated energy prices derives from a reduction in the TR price of oil in 1990 relative to 1988. Thus, only adjusting the dollar price of oil will not totally eliminate the difference in the estimate of the switch-over costs between 1988 and 1990.

¹⁵Based on a recent survey of Polish enterprises, Rosati (1990) has found similar results in Poland.

¹⁶It is assumed in column 6 that the subsidies and taxes on trade among the former CMEA countries will be eliminated. (We ignore MFN tariff rates and any export subsidies which will be uniformly applied.)

The actual situation may vary as well because of the costs of the exporting
(continued...)

enterprises after the switch-over are consistent with the macroeconomic adjustment required due to the terms-of-trade loss, i.e., more exports and less imports.

Comparison with other Recent Estimates

It is intuitive, based on the data of table 3, that it does not make sense to assess the terms-of-trade loss to Hungary by examining only a portion of the import and export bundle employing TR-dollar exchange rates. Rather, the whole bundle of imports and exports must be assessed to determine how much exports the Eastern European countries are giving up in return for the oil and other imports. In particular, Vanous (1990) has estimated the Soviet subsidy of Eastern European oil purchases alone, by introducing what he terms as a realistic exchange rate of the TR for the dollar (based on the Hungarian cross-exchange rate). Employing the same logic and exchange rate would imply (from table 3) that the Hungarian machinery exports were subsidizing the Soviet Union, which would reduce the overall Soviet subsidy.¹⁷

¹⁸(...continued)
enterprise of its energy inputs will likely increase, payment will be less rapid due to the cancellation of the "prompt encashment system," and the government may impose taxes to compensate for the loss of trade taxes. When these other cost increases are taken into consideration, the exporting enterprise may not find that its unit profitability improves after the switch-over.

¹⁷There is an old joke in Eastern Europe about a man who claims to have sold his ugly dog for \$1000. The astonished listener ultimately discovers, however, that the man received no cash for his dog. Rather, he received in return two cats, for which he claims to have paid \$500 each. Examining either side of the sale separately would reveal a great subsidy relative to a market transaction.

Another way to see this is to suppose that all prices in TR were doubled, with no change in any exchange rate. Then the terms-of-trade, which are defined by relative prices in TR are unchanged; but a calculation of the subsidy would be reduced by 50 percent based on oil imports. One could argue that a doubling
(continued...)

Due to the importance of the issue of the switch-over costs, there have been a number of efforts at estimating these costs based on rather aggregate unit value data without a microeconomic investigation of product quality.¹⁸ The most systematic of these is Kenen (1990). He has estimated the terms-of-trade loss as a result of the switch-over based on 1989 quantities and unit value data for Bulgaria, Czechoslovakia, Hungary, Poland and Romania, but calls his estimates illustrative. Kenen's calculations involve the valuation of the import and export bundle using domestically applicable cross exchange rates of the TR to the dollar, with adjustments as he deems appropriate. In the case of Hungary, he estimates it will lose approximately \$2.08 billion and its bilateral commodity terms-of-trade will deteriorate by 36.7 percent. Based on the data of table 3, we believe these estimates are too high for 1989; they failed to adjust prices of the industrial consumer goods sector and prices of the machinery sector were adjusted in the opposite direction indicated by the data of table 3.¹⁹

In unpublished notes, Marrese has estimated the terms-of-trade effect of the switch-over for the six Eastern European CMEA countries. He assumed that the

¹⁷(...continued)

of all import and export prices in TR will induce the authorities to appreciate the domestic currency against the TR. A proportionate appreciation of the domestic currency will leave everything unchanged. The example, nonetheless emphasizes that it is best to avoid a calculation which is so dependent on a somewhat arbitrary exchange rate.

¹⁸See, for example, Institute of International Finance (1990) and Havlik (1990). No explanation of the methodology is available in these studies.

¹⁹Data in Marrese and Wittenberg (1990) suggest a quality adjustment similar to that indicated by table 3. They found that the prices of Hungarian machinery goods sold in the Soviet Union were far lower than comparable Hungarian exports sold in the West (about 80 percent lower even after their adjustment for product quality).

relative prices that prevailed in 1987 (estimated in the Marrese-Wittenberg study) continued to prevail in later years, with the exception of energy prices. For 1990 his estimate (with \$21 per barrel oil) of \$1.9 billion is at the upper range of our comparable estimate (row 2 table 2).²⁰

5. CONCLUSIONS

This paper has surveyed the literature on the Soviet "subsidy" to Eastern Europe and concluded that, given the overall income reducing effect of the Soviet presence, a Soviet subsidy can only be interpreted in the limited context of a static terms-of-trade loss. This paper has introduced a new data set, which is based on interviews of experts in the respective product categories, for the purpose of analyzing the static terms-of-trade loss that Hungary is likely to suffer as a result of the switch-over in 1991 of its trading relationship with the Soviet Union. We believe that these data are at least as reliable as the principal alternative data sources, which are based on selection of unit values from markets defined as comparable by the researcher. We have analyzed the

²⁰Seminar entitled, "The Cost to Central-East Europe of the Disintegration of the CMEA and the 1990 Oil Price Increase," at the OECD-World Bank conference on "the Transition to a Market Economy in Central and Eastern Europe," Paris, November 28-30, 1990. Marrese's estimates for 1988, however, are considerably less than ours; in fact, he finds that Hungary "subsidized" the Soviet Union in 1988. Since, as we explain in appendix 2, for the same relative prices, Marrese's estimates of the Soviet subsidy to Hungary will be larger than our lower bound estimate, the fact that he has a lower estimate than us for 1988 of the Soviet subsidy must derive from different relative price estimates. Marrese, however, did not update his and Wittenberg's microeconomic investigation of relative prices (other than in energy) from 1987.

We also note that Marrese's estimate of the terms-of-trade loss to Hungary at \$26 per barrel is 27 percent greater than our midpoint estimate; this indicates that his estimates are more sensitive than ours to a change in the price of oil, apparently due in part to an assumption of a greater percentage pass-through to the natural gas and electricity sectors than we have assumed.

previously unnoted methodological question of how to assess terms-of-trade changes for countries that have unredeemable trade surpluses. In table 2, the paper has provided a range of updated estimates of the terms-of-trade loss for Hungary, taking into account the unredeemable surplus problem as well as different quantity weights and energy prices. Based on oil at \$21 per barrel, the estimates are that Hungary will suffer an income terms-of-trade loss of between \$1.5 billion and \$2.15 billion, which is more than double the most recently published estimate. In table 3, we have shown that contrary to conventional wisdom, the majority of Hungarian firms exporting to the Soviet Union have been disfavored by the combination of the payments mechanism, exchange rate, tax and subsidy policy. Finally, we have compared and evaluated the methodology of other estimates of the terms-of-trade changes due to the switch-over in Eastern Europe.

Based on early 1991 experience, it appears that there will be a significant decline in Soviet imports from Hungary in 1991. The reduction in the quantity of Soviet imports is related to a variety of problems, many internal to the Soviet Union, which are beyond the scope of this paper.²¹ Since we are estimating terms-of-trade effects only, we ignore the quantity effects in this paper. The reductions in the quantity, however, appear to be at least as important as the price changes from the macroeconomic perspective of Hungary.

APPENDIX 1

DESCRIPTION OF THE SAMPLE

1. In this appendix we use the term industry to refer to one of the ten broad aggregates of products listed in table 1, and we use the term products to refer

²¹See Tarr (1991) for a discussion of these issues.

to subsectors of the industry aggregates. For example, mining and machinery are two of the industries; and oil is a product within the mining industry. Our sample selected representative products of exporting and importing industries. Products were included in the sample, as a rule, based on their importance in Hungarian-Soviet bilateral trade (like buses and grain in Hungarian exports, and crude oil and Lada cars in Hungarian imports). Column 1 presents the value of Hungarian imports from and exports to the Soviet Union by industry in TR, and column 2 presents the share of each industry in total exports or imports. In column 4, an indication of how large the sample was in relation to the industry is provided. For example, the sample of metallurgy exports products was 76.9% of total Hungarian metallurgy exports to the Soviet Union. Column 3 equals column 4 times column 2, and is an indication of how large the sample is in total trade. The sum of column 2 indicates that the products sampled were 52.2% of total Hungarian exports to the Soviet Union and 62.1% of total Hungarian imports.

2. For the selected products which were homogeneous, prices were available from international commodity markets. For products subject to quality variation, information on the potential dollar price of exported (imported) products to (from) the Soviet Union was requested. The ratio of the potential dollar prices to actual transferable rouble prices were defined as relative prices for each product in the sample. First, relative prices for industries were calculated (column 5) by weighting the relative prices of products within industries.²² In all, data were collected on the relative prices of 54 export products and 47 import products.

²²The shares of the representative products within industries were increased equiproportionately such that the sum of the shares equaled unity. The scaled up shares were then used as the weights.

The relative prices for industries were aggregated into overall export and import relative prices using as weights the share of each industry's exports (imports) in total TR exports (imports), yielding .864 for exports and 1.134 for imports.²³ For industries with a lower share in exports or imports than 1 per cent, no sample was taken. In those cases, the sample average was used.

3. In cases where there were multiple estimates from experts regarding the dollar price or when only a minimum-maximum range of prices could be estimated (for example, when the product was not actually traded in dollars), the mean of the estimates was taken as "the" estimate for the product. On the basis of these actual or estimated dollar prices in roubles on the one hand, and their actual foreign trade prices in roubles on the other, relative prices were determined for each selected product. These relative prices indicate the amount of dollars that would have to be paid in case of imports, or could be received in case of exports for, the unit of any product bought or sold for one rouble in Hungarian - Soviet trade.

²³Another average, which was called the sample average, was calculated by taking the weighted average of the price relatives of the individual products in the sample. The weights were obtained by taking the shares of the products in overall imports and exports and increasing the shares equiproportionately such that the weights summed to unity. The sample average was used as the price relative for the small industries for which a sample was not performed.

APPENDIX 2

EXPLANATION OF THE TERMS-OF-TRADE ESTIMATING FORMULAS

In this appendix we elaborate the mathematical relationships that are the basis of the estimates in the text. In the process, we clarify some of the distinctions made in the text, and compare our methodology to that of Marrese and his coauthors. First, it is necessary to define some notation. Let:

PE_i^S - the export price of good i in US dollars

PE_i^{TR} - the export price of good i in transferable roubles

PM_i^S - the import price of good i in US dollars

PM_i^{TR} - the import price of good i in transferable roubles

X_i - the quantity of exports of good i to the Soviet Union

M_i - the quantity of imports of good i from the Soviet Union

Then

$TB(\$) = \sum_i X_i PE_i^S - \sum_i M_i PM_i^S$ - the bilateral trade balance with the Soviet Union in dollars, and

$TB(TR) = \sum_i X_i PE_i^{TR} - \sum_i M_i PM_i^{TR}$ - the bilateral trade balance with the Soviet Union in transferable roubles.

The Subsidy to Hungary: Lower Bound Estimate

In table 1, we obtained the lower bound estimate of the terms-of-trade loss through the use of the following formula:

$$(1) S_L = - \left[\sum_i X_i PE_i^{TR} [PE_i^S / PE_i^{TR}] + \sum_i M_i PM_i^{TR} [PM_i^S / PM_i^{TR}] \right],$$

i.e., by multiplying the exports and imports of each sector denominated in TR by the relative price from our survey. Clearly, multiplication within the terms of the summation in equation (1) yields: $S_L = -TB(\$)$.

Thus, the approach of table 1, which takes the fixed transferable rouble values and multiplies by the relative price, is equivalent to taking fixed quantity weights and valuing this bundle of exports and imports in dollars. That is, it produces an answer to the question of: if the same bundle of exports and imports were traded at dollar prices, how much extra would have to be paid in dollars. If this value

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is negative, as it is in table 1, it indicates that Hungary will have to pay out dollars for the same bundle of imports and exports. Thus, we say that Hungary will suffer a terms-of-trade loss equal to the negative of $TB(\$)$.

The Subsidy to Hungary: Upper Bound Estimate

The calculation in equation (1) values the surplus in TR at zero. An alternative assumption is to assume that it is redeemable at the relative prices that prevailed in 1988, so that the switch-over results in a further loss of income due to the loss of the value of the TR trade surplus. We do this by equiproportionately decreasing exports and increasing imports such that the trade balance is balanced in TR; we then value this balanced trade balance in dollars.

Choose a δ , where $0 < \delta < 1$, such that

$$TB^*(TR) = \sum_i (1-\delta)X_i PE_i^{TR} - \sum_i (1+\delta)M_i PM_i^{TR} = 0.$$

Then:

$$(2) TB^*(TR) = TB(TR) + \delta [\sum_i X_i PE_i^{TR} + \sum_i M_i PM_i^{TR}] = 0.$$

That is, the second term on the right hand side of equation (2) is the trade surplus denominated in TR. We value this counterfactually created trade balance, $TB^*(TR)$ in dollars at the relative prices of 1988 to obtain the upper bound estimate of the income terms-of-trade loss. Focusing on the second term on the right hand side of (2)

$$\begin{aligned} & \delta [\sum_i X_i PE_i^{TR} (PE_i^S / PE_i^{TR}) + \sum_i M_i PM_i^{TR} (PM_i^S / PM_i^{TR})] \\ &= \delta [\sum_i X_i PE_i^S + \sum_i M_i PM_i^S] = \text{the TR trade surplus valued in dollars.} \end{aligned}$$

Since, $TB(TR)$ when valued in dollars at 1988 relative prices is $TB(\$)$, the upper bound estimate of the Hungarian terms-of-trade loss is equal to:

$$(3) S_U = -TB(\$) + \delta [\sum_i X_i PE_i^S + \sum_i M_i PM_i^S].$$

which exceeds the lower bound estimate by the amount of the second term on the right hand side of (3).

Comparison to the Methodology of Marrese

Marrese defines the Soviet subsidy to Hungary as:

$$(4) S_M = -TB(\$) + (\sum_i X_i PE_i^F - \sum_i M_i PM_i^F) / ER^S,$$

where PE_i^F is the export price of good i defined in Hungarian forint, PM_i^F is the import price of good i defined in Hungarian forint, and ER^S is the number of forint one receives for a dollar at the official exchange rate in Hungary, i.e., about 60 in late 1990. In (4) we have reversed the signs of Marrese's formula, since he defines the

Hungarian subsidy to the Soviet Union. How does (4) compare to our estimates?

In the Hungarian trade data we have that

$PE_i^F = PE_i^{TR} ER^{TR}$ where ER^{TR} is the number of forint received for a transferable rouble in Hungary at the official exchange rate. Consequently, the second term in (4) is equal to

$$(5) \sum_i X_i PE_i^S - \sum_i M_i PM_i^S, \text{ where the dollar prices in (5) are obtained}$$

at the cross-rate of the rouble to the dollar that prevails at the official exchange rates in Hungary. That is, the Marrese estimate is equal to the value of the bundle of exports and imports in dollars (our lower bound estimate of the terms-of-trade loss) plus the TR surplus valued at the cross-exchange rate of the TR to the dollar prevailing in Hungary.

To the extent that the second term in (4) differs from the second term in (3), our upper bound estimate will differ from Marrese. We have preferred to avoid the use of exchange rates that are not market determined, because of the arbitrariness that is involved in their use. We believe, however, that a clear upper bound on the valuation of the TR surplus is the assumption that the TR surplus is redeemable at the relative prices that prevailed in 1988, as calculated by our upper bound estimate. Our lower bound estimate will differ from Marrese because it places a zero value on the TR surplus.

The Bilateral Commodity Terms-of-Trade:

The terms-of-trade is defined as the number of units of exports necessary to obtain a unit of imports. For a convertible currency country, it would be: $TOT = PE/PM$. With many commodities, the export and import prices are indices which we now construct for the Soviet-Hungary trade. Define:

$$VX = \sum_i X_i PE_i^{TR}; VM = \sum_i M_i PM_i^{TR};$$

$$\alpha_i^X = X_i PE_i^{TR}/VX; \alpha_i^M = M_i PM_i^{TR}/VM.$$

Then $\sum_i \alpha_i^X = \sum_i \alpha_i^M = 1$.

Case I: Upper Bound Estimate. Redeemable TR Surpluses

First consider, the case where the TR surplus is fully redeemable. Then we define:

$$PE^0 = \sum_i \alpha_i^X PE_i^{TR}; PM^0 = \sum_i \alpha_i^M PM_i^{TR};$$

$$PE^1 = \sum_i \alpha_i^X PE_i^S; \text{ and } PM^1 = \sum_i \alpha_i^M PM_i^S.$$

Then $[PE^1/PM^1]/[PE^0/PM^0]$ is the proportional change in the terms-of-trade. Rerranging and substituting yields:

$$(6) \frac{PE^1/PM^1}{PE^0/PM^0} = \left(\sum_i \alpha_i^X [PE_i^S/PE_i^{TR}] \right) / \left(\sum_i \alpha_i^M [PM_i^S/PM_i^{TR}] \right),$$

which from table 1 is equal to: $.864/1.134 = .764$. Thus our upper bound estimate of the adverse shift in the bilateral commodity terms-of-trade is 23.6 percent.

Case II: Lower Bound Estimate: Unredeemable TR Surpluses

Analogous to the income terms-of-trade calcualtion, if the TR surplus is unredeemable, then the pre-existing terms-of-trade are not as good as revealed by the prices defined in TR. In this case, it is necessary to adjust the index of prices, such that the trade balance is eliminated, i.e., define:

$$PE^0 = \sum_i \alpha_i^X (1-\delta) PE_i^{TR}; \quad PM^0 = \sum_i \alpha_i^M (1+\delta) PM_i^{TR}, \text{ where } \delta \text{ was}$$

defined in this appendix above. Then the proportional change in the terms-of-trade are equal to:

$$\left[(1+\delta)/(1-\delta) \right] \left(\sum_i \alpha_i^X [PE_i^S/PE_i^{TR}] \right) / \left(\sum_i \alpha_i^M [PM_i^S/PM_i^{TR}] \right) = [(1+\delta)/(1-\delta)] (.762)$$

= .83.

Thus, the adverse shift in the bilateral commodity terms-of-trade is only 17 percent if we regard the TR surpluses as unredeemable.

Table 1. Income terms of trade calculations from effects of switching to dollar payments in Hungarian-Soviet trade, 1988

Exports 1988	Actual value (1000 TRbl)	Share in actual trade	Share of sample in total trade	Share of sample in branch's trade	Price relatives (USD/TRbl)	Value in 1000 USD Mean
	(1)	(2)	(3)	(4)	(5)	(6)
Mining	39,529	0.8%			*	35,515
Electricity	2,919	0.1%			*	2,622
Metallurgy	134,648	2.8%	2.17%	76.9%	2.182	293,784
Machinery	2,833,761	59.5%	26.20%	44.1%	0.759	2,150,824
Chemicals	504,309	10.6%	9.42%	89.1%	0.789	397,719
Light Industry	498,178	10.5%	4.65%	44.5%	1.056	525,945
Food Processing	522,612	11.0%	9.77%	64.3%	0.944	493,089
Agriculture	198,333	4.2%			0.944	187,129
Building Materials	20,228	0.4%			*	18,174
Other	11,637	0.2%			*	10,456
Total	4,766,154	100.0%	52.21%		0.864	4,115,257
Imports 1988	Actual value (1000 TRbl)	Share in actual trade	Share of sample in total trade	Share of sample in branch's trade	Price relatives (USD/TRbl)	Value in 1000 USD Mean
	(1)	(2)	(3)	(4)	(5)	(6)
Mining	1,505,476	34.5%	33.38%	96.7%	0.879	1,323,144
Electricity	358,515	8.2%			*	400,756
Metallurgy	477,377	11.0%	9.32%	85.1%	1.993	951,313
Machinery	858,013	19.7%	4.76%	24.2%	0.920	789,181
Chemicals	700,328	16.1%	9.16%	57.0%	1.247	872,990
Light Industry	325,858	7.5%	4.80%	64.2%	1.347	439,053
Food Processing	43,483	1.0%	0.12%	11.4%	0.598	27,218
Agriculture	59,822	1.4%	0.21%	15.2%	1.807	108,095
Building Materials	23,868	0.5%	0.37%	68.3%	0.858	20,482
Other	4,062	0.1%			*	4,540
Total	4,358,802	100.0%	62.12%		1.134	4,936,772

* For sectors with an *** (which are generally small), no price survey was made and the overall sample average was employed. This was .898 for exports and 1.118 for imports. The agriculture and food processing sectors were combined in calculating the price relative.

TABLE 2. COST TO HUNGARY OF THE SWITCH-OVER
TO CONVERTIBLE CURRENCY TRADE

	<u>Income Loss</u> <u>(Millions of Dollars)</u>	<u>Adverse Percentage Change in the Bilateral Commodity Terms-of-Trade</u>
1. 1988 Quantities and Prices	800 - 1,200	17 - 24
2. 1990 Quantities and \$21 per barrel oil	1,500 - 1,900 ^{a/}	30 - 37
3. 1988 Quantities and \$21 per barrel oil	1,750 - 2,150 ^{a/}	29 - 36

^{a/} For each one-dollar decrease in the price of oil, the estimated costs of the switch-over will decrease by US\$76 million. The impact of the oil price increase on natural gas, coal and electricity is incorporated.

Table 3. Estimated Initial Relative
Price effect on Domestic Currency (Forint)
in Exporting and Importing Industries
in Hungary from the Switch Over

Exporting Industries	(1) Relative Price in the Soviet Union (\$/TR)	(2) Cross Exchange Rate in Hungary (63/27.5)	(3) Relative Price in Forint after the switch- over (Ignoring Subsidies) ^{a/}	(4) Subsidy Rate ^{b/}	(5) Cross Exchange Rate by Sector 63/[27.5(1+s)] ^{c/}	(6) Relative Price in Forint after the Switch-over Adjusting for Subsidies
Metallurgy	2.182	2.29	5.0	0.56	1.47	3.20
Machinery	0.759	2.29	1.74	-0.14	2.67	2.02
Chemicals	0.789	2.29	1.81	-0.11	2.57	2.03
Light Industry	1.056	2.29	2.42	0.22	1.88	1.99
Food Processing	0.944	2.29	2.16	1.61	0.88	0.83
Agriculture	0.944	2.29	2.16	0.20	1.92	1.81

Importing Industries	(1) Relative Price in the Soviet Union (\$/TR)	(2) Cross Exchange Rate in Hungary 63/27	(3) Relative Price in Forint after the switch- over (Ignoring Taxes) ^{a/}	(4) Tax Rate ^{b/}	(5) Cross Exchange Rate by Sector 63/[27(1+t)] ^{c/}	(6) Relative Price in Forint after the Switch-over Adjusting for Taxes
Mining	0.879	2.29	2.01	0.81	1.26	1.11
Metallurgy	1.993	2.29	4.57	0.38	1.66	3.31
Machinery	0.92	2.29	2.11	0.00	2.29	2.10
Chemicals	1.247	2.29	2.86	0.17	1.97	2.45
Light Industry	1.347	2.29	3.09	0.18	1.94	2.62
Food Processing	0.598	2.29	1.37	0.02	2.24	1.34
Agriculture	1.807	2.29	4.14	0.21	1.89	3.42
Bldg. Materials	0.858	2.29	1.97	0.00	2.29	1.97

a/ Estimated number of forint received by exporters after the switch-over to dollar payment with the Soviet Union for each forint currently received or paid.

b/ Subsidy and tax rates are calculated on an ad valorem basis from the data in Abel, Hillman and Tarr (1991).

c/ The cross-exchange rate by sector adjusts for the subsidy rate "s" and the tax rate "t".

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