FROM COMMAND TO MARKET: A PERFORMANCE PERSPECTIVE FOR TRANSITION ECONOMIES

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In 1955, the first class of the International and Foreign Economic Administration (IFEA) program began study at Yale. After 25 years, the program name was changed to the International and Development Economics (IDE) program. The IDE class entering in the Fall of 2004 was the 50th class of the combined IFEA/IDE programs. This milestone was recognized with a 50th Class Celebration on April 29 and 30, 2005. The keynote speaker at the event was Madame Yoriko Kawaguchi, the former Minister of Foreign Affairs for Japan, currently Special Adviser to the Prime Minister of Japan, and IFEA alumna of the class of 1972.

Mohsen Fardmanesh, also a graduate of the program, has presented this paper in celebration of the 50th IFEA/IDE class. The Economic Growth Center is pleased to release it as the seventh paper in its Occasional Paper Series.
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Abstract

The existing disappointment with the performance of transition economies is unjustified as far as the contraction of their industries, real wages and capital formation in the 1990s is concerned. The initial under-performance of transition economies that had inherited more severe shortages, as in former Soviet Republics, is to be expected also. We establish these results by estimating what alignment of planning era prices with market prices via a comprehensive price and trade liberalization would imply under ideal market conditions.

Keywords: Price liberalization; Structural adjustment; Transition economies

JEL classification: P2

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1. Introduction

The performance of the former centrally planned economies since the start of their transition in 1989 has been considered disappointing by most; with the former Soviet Republics generally under-performing the Baltic and Balkan states, which in turn under-performed the central European transition economies.\(^1\) Numerous factors, from economic policy to geopolitical situations, have been invoked to explain their performance in relation to one another and to what many had expected.\(^2\)

In this paper, we suggest that the performance assessments of transition economies have underestimated the impact of the market disequilibria that these countries had inherited from their planning era, and, hence, have arrived at a more critical evaluation of their performance than justified. In support of this notion, we address what the mere alignment of the planning era prices with market prices via a comprehensive price and trade liberalization\(^3\) would imply for these economies under ideal market conditions.\(^4\) As in McKinnon (1991),\(^5\) we consider the

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\(^1\) The performance of the five central European countries of the Czech Republic, Hungary, Poland, Slovenia, and Slovakia has been considered mostly satisfactory but not ideal. See Svejnar (2002) for details of the performance of transition economies in various realms from evolution of GDP to marriage and divorce rates. Berend (2003) provides a general historical account of their performance with a focus on the last quarter of the 20th century. The latter study also stresses the importance of gradualism illustrated by the case of Slovenia and of direct foreign investment illustrated by the cases of the Czech Republic, Hungary, and Poland.

\(^2\) For example, Winiecki (1991), Rosati (1994), and Christoffersen and Doyle (2000) study their output fall and growth; and Burda (1993), Bilsen and Konings (1997), and Sorm and Terrell (2000) probe their unemployment and labor markets issues. There have been numerous studies on transition economies. Kornai (1995), Naughton (1995), Blanchard (1997), Boeri (2000), and Roland (2000), to name a few books, and Journal of Comparative Economics, Comparative Economic Studies, and Economics of Transition, to name three specific journals, abound with references in this field. For a division of this field into thirteen topics and a sample of studies on each topic, see Fardmanesh and Tan (2003).

\(^3\) That is, a complete removal of price controls and "red tape". Of course, many transition economies opted for limited market-oriented reforms despite the efficiency costs of such an approach. For the problems of such limited reforms, see Wolf (1991).

\(^4\) In effect, we assess the structural consequences of the "much-debated" complete price and trade liberalization in transition economies, albeit under ideal market conditions. To the extent that our study abstracts from the institutional and international realities facing these economies, some of its results expectedly differ from the emerging stylized facts. Where such a gap occurs it will be noted and explained.

\(^5\) McKinnon (1991) addresses the impact on the manufacturing industries of the alignment of domestic material
alignment of domestic material prices with their respective world prices. In addition, we consider the corrections in the irrationally high price of "priority" manufactured goods and in the irrationally low price of "non-priority" goods and services required by the liberalization.

We study the impact of these price corrections mainly on the factor returns (real wages), the sectoral employment and output, and the capital stock in these economies, using a three-sector, three-factor general equilibrium, small open economy (SOE) model. We consider a case of full-resource adjustment; and model the inherited shortage in the non-tradable goods market explicitly. Although this shortage plays no (significant) role in determining commodity and factor returns, it has a big impact on sectoral changes, which plays an important role in our analysis. We provide quantitative illustrations to all the theoretical results via simulation exercises using estimated parameter values from transition economies. As such, our study provides the direction and ballpark magnitude of the structural adjustments that a (perfect) market mechanism dictates when the former centrally planned economy is put at its command. Knowing the direction and relative magnitudes of these undercurrents is essential, not only to forming any

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6 Material input prices were not allowed to rise sufficiently in these economies and material goods remained in a shortage during their transition in the 1990s, as documented in Blanchard and Kremer (1997), Konings and Walsh (1999), and Bennett et al. (1999). The material shortage was also more severe in former Soviet Republics than in East European economies.

7 The terms "irrational" and "highly distorted" have been widely used to describe the centrally planned price structure that, in particular, served to extract savings for the purpose of rapid growth. In other words, prices are not at equilibrium within the neoclassical framework.

8 Some industries were built and maintained at negative value added at international prices; see McKinnon (1991).

9 Under the centrally planned price system, prices for "basic" goods and services such as agricultural products, raw materials, housing, transportation, public utilities and other services were set "irrationally" low. Prices for "modern" or manufactured goods such as machinery and tools, electronics and chemical products were set "irrationally" high (i.e., below market equilibrium and above market equilibrium respectively).

10 The model used in this study circulated earlier as part of Discussion Paper No. 751 of the Yale Economic Growth Center.

11 As in, among others, Blanchard and Kremer (1997), we interpret dynamically our essentially comparative static results.

12 Chronic shortages associated with the "low-price" or "non-priority" material inputs sector and services sector became such a steadfast feature of all planned economies that Kornai's (1980) "shortage economy" has stood as another name for
realistic performance expectations for these economies, but also to developing any policy for helping their transition to viable and stable market economies.

Our results render the existing disappointment with the performance of transition economies unjustified as far as the contraction of their industries, real wages and capital formation in the 1990s is concerned. For example, by late 1990s their employment and average GDP share of manufacturing/industry declined by 4-to-57% and 10-to-55% respectively.\textsuperscript{13} But these declines are in line with the respective corrections of 24-to-50% and 27-to-57%\textsuperscript{14} required by mere correction of market disequilibria these economies inherited from their planning era. Our results show similar justification for the declines in their real wages and capital formation.\textsuperscript{15} Our model also shows that the general underperformance of the former Soviet Republics is expected and explained by the more severe shortages/distortions they inherited.\textsuperscript{16} Thus, by putting the performance of transition economies in perspective, they are, if not encouraging, far less disappointing than generally perceived.

The characteristics of our model are described in the next section. The structural impacts of the liberalization are analyzed theoretically and via simulations in sections 3 and 4, while the

\textsuperscript{13} Their employment and average GDP share of services rose by 5-to-32% and 15-to-180% respectively.

\textsuperscript{14} Their employment and average GDP share of services is required to rise by 16-to-51% and 13-to-45% respectively.

\textsuperscript{15} Their real wages declined by 11-to-68% by late 1990s. Also, excluding the Czech Republic and Slovenia, the average post-liberalization GDP share of gross fixed capital formation for the 1990s was disappointingly lower than the respective share for the year 1990 by 2-to-52%. These Trends raised some concern about “de-industrialization” of these economies.

\textsuperscript{16} The material shortage was more severe in former Soviet Republics than in East European economies prior to the start of as well as during their transition in the 1990s, as documented in Blanchard and Kremer (1997), Konings and Walsh (1999), and Bennett et al. (1999). Explaining the underperformance of the former Soviet Republics by their more severe shortages here is not to negate the role and importance of other factors in the slightest. It is only to add one more explanation to the already established role of other factors used to explain the performance differences across transition economies and even within the former Soviet block. For example, Berkowitz and DeJong (2003) attribute part of the regional variation in growth in post-Soviet Russia itself to regional differences in price liberalization and new enterprise formation ensuing privatization.
actual experience of transition economies are discussed in section 5. Concluding remarks are provided in section 6. Certain definitions and derivations are presented in Appendix I, while the choice of parameter values for simulations are discussed in Appendix II.

2. The model

Consider a ‘small’ open economy which produces three distinct commodities: a tradable material input (basics, B), a tradable final good (manufacturing, M), and a non-tradable final good (services, N). The three goods are normal in the aggregate; M is an investment good as well as consumption good.

The three sectors follow a constant-returns-to-scale (CRS) and constant-elasticity-of-substitution (CES) production process where weak separability is assumed for M and N. Material input (B) is produced with labor (L) and land (A). The two final goods (M and N) are produced with labor (L), capital (K) and material input (B). M and N are linearly homogenous in value-added (V) and material input (B); and V, in turn, is linearly homogenous in labor (L) and capital (K). There are no restrictions on mobility or substitutability of factors of production. Endowments of labor and land are fixed. Capital, which can expand or contract, is all

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17 This assumption of a single/homogeneous manufacturing good overlooks the change in the composition of this sector caused by the disappearance of some M goods in the beginning of the transition (e.g., the outdated computer industry in Bulgaria) and by the appearance of some new M goods after the liberalization.
18 This sectoral division leaves out the agricultural product/sector that has experienced a decline. However, adding this sector as a fourth one would make the model analytically intractable. It should suffice to say that this sector is undermined by both the shortage for the non-tradable goods and services and the alignment of its prices with the respective world prices. Fardmanesh (1990) models such a double negative structural impact on agriculture in the context of Dutch disease.
19 The changes in productive efficiency resulting from the removal of the central planning constraints are not considered here. This abstraction allows for the use of stable production functions in the model.
20 Human capital is not accounted for in this study and, consequently, the fact that human-capital adjusted wages are low in East European countries relative to western standards plays no role here. Such a gap causes the migration of their skilled workers to high-wage countries, as observed in recent years.
21 This allows for disappearance of the excessive and old (low quality) capital inherited from the planning era, as
domestically owned and has a zero rate of depreciation.\textsuperscript{22} A capital rental based on world prices is used.\textsuperscript{23}

Demand for the two final goods is a function of their (relative) prices and (real) income.\textsuperscript{24} In order to capture the most important characteristic of the former central planning economies or the "shortage economies", the inherited shortage in the non-tradable goods market is explicitly modeled. The shortage, represented as a percentage of the N equilibrium, plays an important role in the analysis.

Price liberalization abolishes previous rationing schemes while trade liberalization links the economy with the world markets. Consequently, the price of N rises to eliminate the shortage in the respective market while the price of B rises to its world level. The price of M adjusts downwards to its world level. The prices of N and B rise relative to that of M. Following these two relative price changes, the economy adjusts to a new (perfect) market-determined equilibrium from the old centrally-planned (dis)equilibrium.

The impact of liberalization in the three sectors is addressed by studying the respective market equilibrium conditions. The (non-tradable) good and factor markets clear and profits are zero. The distinction between the tradable and non-tradable goods is essential here, as in Dutch Disease analyses. Domestic demand for and supply of the non-tradable good N must equal. By contrast, the domestic demands for and supplies of the two tradable goods B and M need not

\textsuperscript{22} This simplifies our calculations without changing the results.

\textsuperscript{23} Neary and Purvis (1983) also do this but from a financial market perspective; Fardmanesh (1990), on the other hand, does this from a real-side perspective similar to the one here.

\textsuperscript{24} Corden and Neary (1982) and Fardmanesh (1990) also model demand in this way.
equal. However, the overall trade must be balanced, thus trade balance is assumed exogenous and set at zero.\textsuperscript{25}

As in all small open economy models, prices of the two tradable goods B and M are determined in the respective world markets, while demand and supply equilibrium in the domestic market for N determines its price. The price of M equals one by choice of numeraire; a proportional rate of change is denoted by a circumflex (\(^\wedge\)), e.g., \(\dot{x} = dx/x\).

3. The theoretical analysis

With land and labor substitutable in our full adjustment analysis, the domestic production of material input is determined endogenously along with those of manufacturing and non-tradable goods as follows.

The profit-maximization conditions are described by:

\[
\begin{align*}
    a_{LB} W + a_{AB} V &= \pi \\
    a_{LM} W + a_{KM} R + a_{BM} \pi &= P_M \\
    a_{LN} W + a_{KN} R + a_{BN} \pi &= P_N
\end{align*}
\]

where \(a_{ij}\) is the quantity of factor \(i\) (\(i=\text{L,K,A,B}\)) required to produce a unit of commodity \(j\) (\(j=\text{M,N,B}\)), \(W\) is the return to labor (\(\text{L}\)), \(V\) is the return to land (\(\text{A}\)), and \(R\) is the economy-wide return to capital (\(\text{K}\)). And \(\pi\), \(P_M\) and \(P_N\) are the prices of B, M and N, respectively; \(P_M\) equals one by the choice of numeraire.

\textsuperscript{25} This assumption may seem restrictive. However, allowing for a trade imbalance (deficit), even when granting it an impact on consumption, magnifies the impact of the inherited shortage and leaves the respective results qualitatively intact.
The capital rental (R), which had been set low under the planning system, is now determined by world prices:

\[ R = P_M \cdot r^* \]  

where \( r^* \) is the world interest rate. The domestic interest rate equals the world interest rate, and the marginal revenue product of capital (R) equals the opportunity cost of capital usage (\( P_M \cdot r^* \)) under full liberalization. The manufacturing good is an investment good also, as noted in last section.

The factor market equilibrium conditions are described by:

\[ a_{KM} M + a_{KN} N = K \quad (5) \]
\[ a_{LM} M + a_{LN} N + a_{LB} B = L \quad (6) \]

where A is the land endowment, K is the long-run capital stock, and L is the labor endowment. While A and L are exogenous and fixed, K is endogenous.27

The non-tradable goods market equilibrium condition is described by:

\[ \hat{N} = N^d (P_N, Y) + \hat{J} \quad (8) \]

where \( N \) and \( N^d \) represent the supply of and demand for the non-tradable good, \( J \) is the inherited shortage for \( N \) represented as a percentage of the equilibrium \( N \), and national income, \( Y \), is:

\[ Y = M + P_N N - \pi (B^d - B) \quad (9) \]

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26 In all equations M and N denote the quantity supply of the respective two goods.

27 As the trade balance is assumed exogenous and set at zero, all capital is domestically owned in this model.

28 This arises from the pre- and post-liberalization market conditions of \( N_{\text{pre}} + J = N_{\text{pre}}^d \) and \( N_{\text{post}} = N_{\text{post}}^d \) which indicate a shortage of \( J \) units initially.

29 Considering \( Y \), gross domestic product, as national income assumes that net foreign earnings as well as capital depreciation are zero. Allowing for the more realistic case of a trade deficit and negative foreign earnings only reinforces the impact of the shortage and, hence, strengthens our results.
where B is the domestic production of material input, B^d is the material input demanded/used by the entire economy, and the term π(B^d - B) is the net import of the material input. The economy-wide demand for the material input, B^d, is given by:

\[ a_{BM} M + a_{BN} N = B^d \]  \hspace{1cm} (10)

The full adjustment impact of the liberalization can be derived parametrically from the above conditions.\(^{30}\)

The impact on commodity prices and factor returns, which are now uniquely determined by world prices,\(^{31}\) all measured in units of M, are described by:

\[ \hat{p}_N = p_1 \hat{R} + p_2 \hat{\pi} \]  \hspace{1cm} (11)

\[ \hat{P} = \phi_N p_1 \hat{R} + \phi_N p_2 \hat{\pi} \]  \hspace{1cm} (12)

\[ \hat{W} = -w_1 \hat{R} - w_2 \hat{\pi} \]  \hspace{1cm} (13)

\[ \hat{V} = v_1 \hat{R} + v_2 \hat{\pi} \]  \hspace{1cm} (14)

\[ \left( \frac{\hat{W}}{\hat{P}} \right) = -(w_1 + \phi_N p_1) \hat{R} - (w_2 + \phi_N p_2) \hat{\pi} \]  \hspace{1cm} (15)

The wage rate falls unambiguously. As both the domestic price of material input and the domestic rental cost of capital adjust upward to their world levels, firms opt for less material-intensive and less capital-intensive technology, and the (product) return to labor falls.\(^{32}\) The (product) return to land rises unambiguously; for the price of B (π) rises while the (product) return to its other production factor, labor, falls. The (product) return to land rises by more than the increase in the material price.

\(^{30}\) See Appendix I for derivations and definitions of notations.

\(^{31}\) Given equation (4), with M being the numeraire here, the percentage change (increase) in the capital rental due to the liberalization would equal the percentage change (increase) in the domestic interest rate resulting from its alignment with the world interest rate.

\(^{32}\) An increase in π, like technical regress, depresses the return to labor (and capital), for given commodity prices. As Bruno and Sachs (1982) demonstrates, an increase in the material input price shifts the factor price frontier inward in the W-R space and depresses the payment to labor and capital.)
The impact on the price of the non-tradable good seems ambiguous, however. The rise in the material price and that in the rental cost of capital both have a direct positive effect on the production cost of N. They also have an indirect negative effect on the production cost of N via their abovementioned negative impact on the wage rate. If, in terms of factor shares in unit cost, N is plausibly more labor-intensive than M while M is plausibly more material-intensive than N, the rise in the material price lowers \( P_N \), as its direct positive impact on \( P_N \) is dominated by its indirect negative impact on \( P_N \). If N is also less capital-intensive than M, the rise in the rental cost of capital too would lower \( P_N \). It should be noted that the domestic price of the non-tradable good is entirely cost determined, and that the shortage for N raises its production without affecting its price. With the price of the manufactured good being the numeraire, the impact on the overall price level, \( P \), is proportional to that in \( P_N \). Thus, \( P \) falls if \( P_N \) declines.

The impact on real wages or the welfare of a representative worker, being the difference between the change in the wage rate and that in the overall price, seems ambiguous too. But since the wage rate is falling unambiguously and the overall price is affected by offsetting secondary effects, the real wage will most likely fall.

The impact on sectoral employment is given by:

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\[ \text{A lower } P_N \text{ means that the nominal price of N must rise by a lower percentage than that of M.} \]
\[ \text{As in Fardmanesh (1990), the impacts on the wage rate and the non-tradable good price are not jointly determined by the respective domestic product and factor markets as is in a closed economy case.} \]
\[ \text{The reason for considering this variable here is to separate the impact of the liberalization on the real wage via the goods prices. Otherwise, the concept of "overall price level" has no role to play in our real-side analysis.} \]
\[ \text{The expenditure share of good N is the proportion factor.} \]
\[ \text{It is the assumption of full employment that brings about a fall in wages, and it is the "full-employment wages" that are discussed here. In practice, given the existence of unemployment and a rise in it, real wages of employed workers can rise in the long run, as has been the case in these countries. Be that as it may, the fall in the "full-employment wages" along with the rise in the overall welfare of the economy resulting from the removal of the distortionary price policies of the planning era entail a rising income inequality, as experienced in the East European countries.} \]
\[ \text{In equation (16) the ratio in front of the bracket is the elasticity of the marginal product curve of labor in sector B; see Jones (1971).} \]
\[ \hat{L}_B = \frac{\sigma_B}{\theta_{AB}} \left[ \hat{w}_1 \hat{R} + (1 + \hat{w}_2) \hat{\pi} \right] \] (16)

\[ \hat{L}_M = \left( \frac{1}{D} n_{r} - c_1 w_1 - c_1 \right) \hat{R} + \left( \frac{1}{D} m z - c_1 w_2 + c_2 \right) \hat{\pi} - \frac{1}{D} \lambda_{LN} \hat{J} \] (17)

\[ \hat{L}_N = \left( \frac{1}{D} n_{r} - c_3 w_1 - c_3 - c_4 p_1 \right) \hat{R} + \left( \frac{1}{D} n_{r} - c_3 w_2 + c_4 + c_4 p_2 \right) \hat{\pi} + \frac{1}{D} \lambda_{LM} \hat{J} \] (18)

The employment in sector B, as is the case with the output of B,\(^{39}\) solely depends on its real product wage. It rises unambiguously because its output price increases while the wage rate falls. It is unaffected by the shortage, but is positively affected by the rise in the material and capital costs.

The employment in sector M falls and that in sector N rises, given a large shortage. The higher costs of material input and capital has an ambiguous impact on the employment in these sectors. It (and the lower wage rate) induces firms in both sectors to substitute labor for capital and material input. But, it affects employment in both sectors negatively by raising their production costs and contracting their supply as well. The shortage for N, on the other hand, induces a definite reallocation of labor from sector M into sector N to meet the existing excess demand for N. The unambiguous employment effect of a significant shortage expectedly dominates the ambiguous and secondary employment effect of the rise in the material and capital costs. Thus, the employment in sector N rises and that in sector M falls.

The impact on sectoral output is given by:

\[ \hat{B} = \theta_{LB} \frac{\sigma_B}{\theta_{AB}} \left[ \hat{w}_1 \hat{R} + (1 + \hat{w}_2) \hat{\pi} \right] \] (19)

\(^{39}\) See Appendix I.
The output of B increases unambiguously, as the material price increases while the wage rate falls. Since factor price changes are determined by world prices, the change in the output of B is independent of the rest of the domestic economy. However, the output of M and N are related to each other through their joint labor supply.

As for the output of M and N, the increase in the price of the material input and in the cost of capital undermines both sectors by raising their production cost. The shortage, while having no impact on prices, raises the output of N at the expense of that of M. The output of M falls unambiguously. The output of N rises if the shortage is sufficiently large in relation to the increase in the cost of capital and material input.

It should be noted that the domestic output of M is determined solely on the supply side, as M is a tradable good. By contrast, the demand for N plays an important role in determining the output of sector N. The inherited shortage for N raises its production. However, the final

\[
\hat{M} = \frac{1}{D} ( m_{r} \hat{R} + m_{x} \hat{\pi} - \lambda_{LN} \hat{J}) \quad (20)
\]

\[
\hat{N} = \frac{1}{D} ( n_{r} \hat{R} + n_{x} \hat{\pi} + \lambda_{LM} \hat{J}) \quad (21)
\]

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It should be noted that the domestic output of M is determined solely on the supply side, as M is a tradable good. By contrast, the demand for N plays an important role in determining the output of sector N. The inherited shortage for N raises its production. However, the final
increase in the output of N is smaller than the initial excess demand for it. The higher material input price and capital cost depresses the demand for N through the national income channel, since it reduces economy-wide production/income. This eliminates part of the initial shortage.

The impact on the capital stock is given by:  

\[ \hat{K} = \frac{1}{D} \left[ (\hat{\lambda}_{KM} m_r + \hat{\lambda}_{KN} n_r) \hat{R} + (\hat{\lambda}_{KM} m_\pi + \hat{\lambda}_{KN} n_\pi) \hat{\pi} - (\hat{\lambda}_{KM} \hat{\lambda}_{LM} \hat{\lambda}_{KN} \hat{\lambda}_{LKN} \hat{\lambda}_{LM} \hat{J}) \right] \tag{22} \]

The increases in the price of the material input and in the cost of capital unambiguously reduce the capital stock significantly, by lowering both output and unit-capital usage in both sectors M and N. The shortage may increase the capital stock somewhat if sector N uses a larger share of it, as was the case on the average in our sample of the less distorted centrally planned economies of Eastern Europe. Nonetheless, given a significant contraction in sector M and a large increase in material and capital costs, the total capital stock declines. It should be noted that the contraction in sector M along with the plausible decline in the total stock of capital point to a potential "de-industrialization" of the economy in the transition period. And the more

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45 This is obtained from totally differentiating equation (6) and substituting for the changes in M and N from equations (20) and (21).

46 Where the opposite is the case, the shortage would have a negative impact as well, and the capital stock would fall more.

47 This result should be considered in light of the excessive investment and capital accumulation under the planning system. Moreover, if we consider positive population (or technological) growth, "a decline in total capital stock", as is used here, corresponds to "a decline in total capital stock relative to its previous trend"; see Bruno and Sachs (1985). With this interpretation our theoretical result is in line with the experiences of the East European countries such as Poland and Hungary, but not with those of the Czech and Slovak Republics where the rate of investment has held strong with the help of new western capital.

48 Regarding the impact on the capital stock in each sector, its real product return in sector M (N) falls (rises) with the reallocation of labor from sector M to sector N. This would induce a divestment (investment) in sector M (N) when capital can expand/contract and is mobile in due time, as evidenced by the experience of the transition economies in the 1990s.

49 Since savings and investment are not considered in this analysis, we do not stress this result but only note that "industrialization" and the standard of living have been positively related in modern history. Also, as noted in footnote 43, such a "de-industrialization" may not occur in practice because of, for example, foreign capital, as evidenced by the experiences of the Czech and Slovak Republics. Finally, to the extent that pre-liberalization price policies were
severe the inherited shortages and price misalignments are,\textsuperscript{50} the more drastic this “de-industrialization” and other impacts of the liberalization would be.\textsuperscript{51}

Our results, when put in the context of a successful transition economy subject to high growth, can be interpreted as follows:\textsuperscript{52} the liberalization entails a significant downward pressure on real wages along with an even more significant upward pressure on real return to capital and land.\textsuperscript{53} It also leads to a significant shift in the employment and output structure of the economy away from the former "high-price" or "priority" manufacturing and towards the former “non-priority”, nontraded goods and services.\textsuperscript{54} These are in line with the experience of the transition economies throughout the 1990s.

It should be noted that at the initial stage of the transition fully developed (labor)\textsuperscript{55} markets do not exist and stabilization policies abound.\textsuperscript{56} Then, the structural adjustment discussed above manifests itself mostly, if not only, in the downward direction\textsuperscript{57} and stagflation distortionary, their removal could put the economy at a higher level of overall welfare.

\textsuperscript{50} The material shortage was more severe in former Soviet Republics than in East European economies prior to the start of as well as during their transition in the 1990s, as documented in Blanchard and Kremer (1997), Konings and Walsh (1999), and Bennett et al. (1999).

\textsuperscript{51} Foreign aid in the form of credit reinforces the impact of the shortage, as part of the extra spending falls on the non-tradables. It further expands the non-tradables sector at the expense of manufacturing. It shifts the composition of the (balanced) trade away from imports of basic inputs towards imports of manufacturing. It, in the likely amounts, has quantitatively negligible impact, however.

\textsuperscript{52} And these outcomes cannot be changed by foreign aid in the usual amounts.

\textsuperscript{53} This explains why foreigners have been eager to become capital and land owners in these countries but they are not rushing there to be a worker. This also explains why countries like Poland have passed laws against ownership of (arable) land by foreigners.

\textsuperscript{54} All of these transition economies experienced a shift in their employment and output structure away from manufacturing/industry and towards services throughout the 1990s. By the end of 1990s their average GDP share of industry declined by 10-to-55\% (-30\%) while their average GDP share of services rose by 15-to-180 \% (+75\%).

\textsuperscript{55} Lack of well-functioning capital markets, too, can result in labor immobility by making it difficult for workers to finance a new business or their housing in a different region.


\textsuperscript{57} For a modeling and analysis of this case; see Fardmanesh and Tan (2003).
ensues along with a decline in real wages, as was observed in many transition economies in the early 1990s.

4. The simulation analysis

The impacts of price and trade liberalization are explored quantitatively via four simulation exercises. In simulation 1, we consider both the shortage for non-tradable goods and services and misalignments in the price of the material input and in the cost of capital. In simulation 2, we consider the impact of shortage alone. In simulation 3, we consider only the impact of changes in the material input price and in the cost of capital. In simulation 4, we consider the impact of changes in the material input price alone. While simulation 1 reveals the overall impact of the liberalization, simulations 2 through 4 allows us to assess the relative significance of each of the three distortions.

We consider two levels of distortions low and high in order to encompass various transition economies with different levels of distortions inherited from the planning era. Accordingly, the inherited shortage is set at 20% or 50% of its equilibrium amount (\( \hat{J} = 20\% \) or 50%). The increase in the domestic price of the material input required to align it with the respective world price is set at 30% or 80% (\( \pi = 30\% \) or 80%). The increase in the domestic

\[\begin{align*}
58 \text{Comparing these results with their counterparts in simulation 3 provides a measure of the impact of the rise in the cost of capital alone. Its impact on, for example, } P_N, \text{ which is } .009\%, \text{ is reported as } 0\% \text{ due to rounding of the figures.}
59 \text{Comparing the results from simulations 2 and 3 reveals the significance of the misalignments in the price of the two tradable goods relative to that of the shortage for the non-tradable goods.}
60 \text{We construct this range from the } 50\% \text{ estimated average used in Fardmanesh and Tan (2003). Our lower bound figure of } 20\% \text{ is a conservative estimate given the long multi-year wait time for getting housing in certain locations and public utilities such as telephone services even in the less distorted planning economies such as the former Czechoslovakia. And our upper bound figure of } 50\% \text{ is not excessive given the near total neglect of the demand for such products in some of the former Soviet Republics.}
61 \text{Our upper bound increase in the material input price is set at } 80\% \text{ in light of the persistent shortage for material goods in the transition economies in the 1990s. A high value for this variable changes only the impact of the}
\end{align*}\]
cost of capital to align it with its world counterpart is set at 40% or 100% ($\hat{R} = 40\% \text{ or } 100\%$). The structural parameters of the economy are set at values presented in Table 1. The simulation results are summarized in Table 2, with each entry providing a range of values covering transition economies with different levels of distortions from low to high. The results are stable: varying the parameter values within realistic ranges does not alter them qualitatively.

Regarding the commodity prices and factor returns, simulation 1 shows that the price of the non-tradable goods falls by a small amount (2%-to-6%). The overall price level falls by an even smaller amount (1%-to-3%), with the fall in $P$ being about half that of $P_N$. However, the wage rate falls significantly (17%-to-45%), and the return to land goes up by a very large amount (64%-to-171%). The return to capital rises domestically a large amount by our construct of aligning it with its world counterpart (40%-to-100%). Accordingly, the real wage falls significantly (16%-to-42%), while the real returns to land and capital rise by very large amounts (65%-to-174% and 41%-to-103% respectively). Simulation 2 shows that the shortage plays no role here: it has no impact on commodity prices and factor returns, as discussed in the liberalization on the return to labor and land in a noticeable way, and has a small effect on the sectoral employment and output.

62 The increases in $R$ are set higher than that in $\pi$ because under planning capital was more under-priced than material inputs.

63 We use the same set of structural parameter values as in Fardmanesh and Tan (2003), but also account for the ones relevant only in our full adjustment analysis. Also, for the case of high distortions we switch between sectors M and N their sectoral shares in labor endowment as well as those in capital stock to better reflect the transition economies that started their transformation with high distortions. This adjustment in the values for the said four structural parameters makes the changes in $L_M$ and $M$ smaller and the changes in $L_N$, $N$, and $K$ larger.

64 In the two cases of $L_N$ and $N$, where the shortage has a positive impact and the corrections in $\pi$ and $R$ have a negative impact, the effects of the shortage easily dominate. Even using higher values for elasticities to reflect a longer period of adjustment would change (increase) the results quantitatively while leaving them intact qualitatively.

65 This is due to the expenditure share of $N$ being about one half here.

66 The real wage would decline more where the rise in the material input price and the spending share of $N$ are larger.
theoretical section. And simulations 3 and 4 show that the adjustment in the material input price plays a far more important role than the cost of capital.67

Regarding the sectoral employment and output, simulation 1 shows that they rise significantly in sector N (16%-to-51% and 13%-to-45% respectively) and fall by larger amounts in sector M (24%-to-50% and 27%-to-57% respectively). Simulations 2 and 3 show that these sectoral changes are caused mostly by the shortage, unlike with changes in the commodity prices and factor returns. The rise in the material input price and capital rental has a much smaller (negative) role in all these sectoral changes. And simulations 3 and 4 show that the adjustment in the material input price plays by far a more important role in these sectoral changes than the adjustment in the cost of capital, as with the changes in commodity prices and factor returns.68

As for the employment and output in sector B, simulation 1 shows that they rise by much smaller amounts than those in sector N (8%-to-22% and 3%-to-9% respectively) but, as simulation 2 shows, the shortage plays no role here. The importance of the role of the material price relative to that of the cost of capital, as simulations 3 and 4 show, is the same as with previously discussed changes.

The magnitude of structural shifts from sector M to sector N is mostly determined by the extent of the shortage inherited from the planning system. But the magnitude of the expansion in sector B depends solely on how misaligned the domestic material price and the domestic cost of capital are from their world counterparts.

---67 In the case of PN and P, the adjustment in the cost of capital has such a negligible (positive) impact that the rounding of the figures records it as zero in some cases.
68 In the case of the employment changes in sectors M and N, the adjustment in the cost of capital has such a negligible (negative) impact that the rounding of the figures records it as zero.
Regarding capital stock, simulation 1 shows that it falls by a small amount in a low-distortion transition economy (-2%) but declines significantly in a high-distortion transition economy (-17%). Simulations 2 and 3 show that the shortage may even increase the capital stock by a small amount (2%) in a low-distortion economy while the adjustment in the material input price and capital rental cost has a larger negative impact on it even in a low-distortion country. And simulations 3 and 4 show that even for changes in capital stock adjustment in the material input price plays a (slightly) more important role than the adjustment in the cost of capital. This confirms once again a key role for the persistent material shortages and the respective rise in material prices in transition economies.

In our simulations, the impact of the shortage for the non-tradable goods and services, where it exists as with sectoral employment and output and the overall capital stock, by far dominates the impact of the material and capital cost adjustment in all cases except the capital stock. And the impact of the material cost adjustment is stronger than the impact of the capital cost adjustment in all cases except the real return to capital itself. These results once again point to the importance of the shortages for the non-tradable goods and services that transition economies inherited.

5. The experience of transition economies

We now relate our results to the actual experience of the former centrally planned economies of Eastern Europe and Soviet Republics to assess their performance. We consider the changes in their actual real wages, sectoral employment and output, and capital formation/stock in the 1990s.  

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69 Data availability restricts our comparison to these variables. The sectoral output and employment data are for 1999 and the real wage data are for 1998, as determined by data availability. For performance data, see Economic Survey of
Despite many simplifications and use of idealized markets in our model and simulations, our theoretical/qualitative results are all in line with the characteristics of their experiences. Our simulation/quantitative results also all greatly overlap with the magnitudes of their experiences, as Table 3 shows, rendering the general disappointment with their performance unjustified.\(^{70}\)

As for the impact of the liberalization on real wages, not only did they experience a downward pressure on their real wages but also, excluding the Czech Republic, all transition economies still had a lower real wage in late 1990s than at the start of their transition, which is in line with our results.\(^{71}\) By the late 1990s, excluding the Czech Republic,\(^{72}\) the Central European transition economies (CETE-5),\(^{73}\) which dominate the parameter estimates used in our simulations, experienced a decline of 11-to-20% (-15%) in their real wages.\(^{74}\) The South European transition economies (SETE-7) experienced a decline of 39-to-52% (-45%) in their real wages.\(^{75}\) The Commonwealth of Independent States (CIS) experienced a decline of 18-to-68% (-50%) in their real wages.\(^{76}\) The three Baltic States experienced a decline of 37-to-55% (-46%) in their real wages.\(^{77}\)

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\(^{70}\) Since labor was mostly immobile in the transition economies in the immediate years following the liberalization, we contrast our full adjustment results with the actual performance of these economies at the end of 1990s.

\(^{71}\) In our comparative static simulation exercises the real wage would decline. But, the real wage can be expected to rise eventually as the transition progresses because of the increase in labor productivity resulting from a more efficient market driven allocation, foreign investment and economic growth. This materialized in the first decade of transition for some but not all (6 out of 15) economies. More specifically, Czech Republic, Poland, Slovakia, Slovenia, Latvia, and Georgia had a higher real wage in 1998 than in 1992. However, Hungary, Bulgaria, Romania, Azerbaijan, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russia, and Turkmenistan had a lower real wage in 1998 than in 1992.

\(^{72}\) The Czech Republic that, as J. Svejnar, K. Terrel and others have pointed out, had some intersectoral and interregional labor mobility from the start and has been more successful.

\(^{73}\) CETE-5 includes Czech Republic, Hungary, Poland, Slovakia, and Slovenia.

\(^{74}\) Fardmanesh and Tan (2003) report the negative real wage experiences of transition economies along with their respective unemployment rate (UR) and output fall (OF) following the start of their liberalization.

\(^{75}\) SETE-7 includes Albania, Bulgaria, Romania, Bosnia and Herzegovina, Croatia, The FYR of Macedonia, and Yugoslavia. The two figures reported here pertain to Bulgaria and Romania respectively. The data available for Albania and the war stricken former Yugoslav Republics do not have sufficient frequency for our comparison.

\(^{76}\) CIS includes Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. The range of values reported here excludes Armenia, Tajikistan, Ukraine, and Uzbekistan for which real wage data are not available.
Considering all these transition economies as one group, by late 1990s they experienced a decline of 11-to-68% (-39%) in their real wages. This performance is far less disappointing if we consider that even under ideal market conditions depicted in our analysis the mere alignment of planning era prices with their world market counterparts via a comprehensive price and trade liberalization would require a decline of 16-to-42% in real wages in these economies.

Regarding the sectoral employment, all transition economies experienced a structural change away from jobs in the tradables (industry) and towards the non-tradables (services) throughout the 1990s in line with our results.\(^\text{78}\) By late 1990s in CETE-5, the employment share of industry dropped by 6-to-11% (-9%) while that of services increased by 23-to-32% (+27%).\(^\text{79}\) In SETE-7 the respective figures were 32-to-34% (-33%) and 5-to-23 (+19%).\(^\text{80}\) In CIS they were 4-to-57% (-29%) and 5-to-28% (+25%);\(^\text{81}\) and in the three Baltic States they were 29-to-30% (-29.5%) and 22-to-30% (+26%).\(^\text{82}\)

Considering all these economies as one group, the employment share of their industry dropped by 4-to-57% (-25%) while that of their services increased by 5-to-32% (+24%). Again when this performance is evaluated in light of our simulation results, a drop of 24-to-50% in manufacturing jobs along with a rise of 15-to-51% in services jobs, the actual contraction in the employment share of industry in the transitional economies is not surprising or disappointing at all.

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\(^{77}\) Estonia, Latvia, and Lithuania constitute this group. The two figures reported here are for Latvia and Lithuania; no data are available for Estonia.

\(^{78}\) The structural job shift is even stronger if manufacturing which is a subset of industry is considered instead. Because of lack of manufacturing data for many transition economies we use the less desirable industry data.

\(^{79}\) Slovenia is excluded due to lack of data.

\(^{80}\) Once again, only for Bulgaria and Romania data are available.

\(^{81}\) Armenia had very small employment shifts lowering the lower bound and the averages for the CIS group. Kyrgyzstan and Turkmenistan are excluded due to lack of data. Also, Republic of Moldova and Tajikistan experienced a decline in their services sector jobs (by 5% and 12%) and a significant rise in their agriculture sector jobs (by 30% and 16%). Employment in Agriculture remained high in many transition economies. At the end of the 1990s in Albania, Republic of Moldova and Tajikistan over half of the workforce was employed in agriculture, as noted in TRENDS IN EUROPE AND NORTH AMERICA 2001.
The rise in the employment share of their services is certainly smaller than our analysis suggests. But that is not an issue as it is the drop in the share of manufacturing jobs that has been a cause for concern.

As for the sectoral output, following the change in their employment structure, all transition economies experienced a shift in their output structure away from industry and towards services throughout the 1990s in line with our results. By the end of the 1990s, in CETE-5 this shift consisted of a drop of 15-to-45% (-25%) in GDP share of industry and an increase of 15-to-90% (+40%) in GDP share of services. In SETE-7 the respective figures were a drop of 25-to-50% (-40%) and an increase of 35-to-75% (+55%). In CIS the two figures were a drop of 10-to-55% (-30%) and an increase of 35-to-180% (+80%); and in the three Baltic States they were a drop of 35-to-45% (-40%) and an increase of 90-to-170% (+130).

Considering all of the transition economies together, by the end of 1990s their GDP share of industry dropped by 10-to-55% (-30%) while that of services increased by 15-to-180% (+75%). Again when this performance is evaluated in light of our simulation results of a drop of 27-to-57% in GDP share of manufacturing along with a rise of 13-to-45% in GDP share of non-traded goods and

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82 No data are available for Estonia, and Latvia and Lithuania had similar experience.
83 As with employment changes, the structural output shift is even stronger if manufacturing which is a subset of industry is considered instead. Once again, because of data availability we have to use industry data.
84 This structural change was exacerbated in all but a few transition economies as the decade of the 1990s unfolded. Only in Hungary, Albania, Azerbaijan, and Belarus was this structural change somewhat mitigated with the passage of time.
85 These ranges are for Albania, Bulgaria, and Romania, as no data are available for former Yugoslav Republics because of war conditions.
86 This excludes Tajikistan and Turkmenistan due to lack of consistent data over time.
87 For the specific transition economies (Bulgaria, Czech Republic, Hungary, Poland, Russia, and Slovakia) from whose data we derived our structural parameters, the respective shifts consist of a drop of 12-to-47% (-30%) for industry and an increase of 19-to-77% (+40%) for services. Their actual experiences are closer to our simulation results (of a drop of 27-to-57% and an increase of 13-to-45%). The gap between our simulation results and the actual experience of these six countries for the tradables would have been even smaller if we could have used the data for their manufacturing rather than industry output.
services, the actual contraction in the output share of industry in the transitional economies is not surprising or disappointing at all.

Regarding the capital stock, at the end of the 1990s annual GDP share of gross capital formation was still lower than at the start of that decade in all transition economies except CETE-5 and two CIS countries with special circumstances. More importantly, in all but two transition economies, average GDP share of gross capital formation for various post liberalization years between 1992 and 2000 was lower than in 1990. Even in the more successful transition economies of CETE-5, excluding the Czech Republic and Slovenia, the average post liberalization GDP share of gross fixed capital formation was lower than the respective share for 1990 by 2-to-8% (-5.5%). In SETE-7 it was lower by 23-to-48% (-32%). In CIS it was lower by 17-to-39% (-29%); and in the three Baltic States it was lower by 17-to-52% (-34%). More importantly, in the 1990s all transition economies except the Czech Republic experienced a decline in their capital stock at least for a few years. Even in CETE-5, excluding the Czech Republic and Slovakia, the capital stock first declined by 5-to-7% (-6%) before it rose beyond what it had been at the start of their transition.

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88 The development of natural resource (oil) industries in the two CIS members Azerbaijan and Turkmenistan caused a strong impetus to their investments.
89 Only Slovenia experienced an increase (of about 30%) in its average GDP share of gross capital formation after liberalization. The respective average figure (of about 25%) for the Czech Republic for the 1992-2000 period was close to her GDP share of gross capital formation in 1990.
90 This excludes the former Yugoslav Republics due to lack of data.
91 The figures for CIS exclude Azerbaijan, Belarus, Tajikistan, and Turkmenistan due to lack of sufficient data for the 1990s.
92 We construct capital stock figures for these economies for the period 1990-2000 using their respective aggregate investment figures and a perpetual inventory method as in Easterly and Levine (2001). For the calculation of the initial capital stock and more details, see Appendix II.
93 The Czech Republic and to a lesser extent Slovakia enjoyed exceptional status among foreign investors from the start. The former experienced a steady increase in its capital stock throughout the 1990s and the latter experienced a slight decline of less than 1% in its capital stock before facing a steady rise in it after 1996, according to our estimates.
94 In Hungary by the end of the decade it nearly returned to its 1990 level.
SETE-7 it declined by 8-to-24% (-17%).\textsuperscript{95} In CIS, excluding Georgia,\textsuperscript{96} it declined by 2-to-29% (-19%), and in the three Baltic States it declined by 7-to-24% (-17%). The capital stock was still lower at the end of the 1990s than what it had been at the start of the transition in all SETE-7 economies, in all but one CIS economies,\textsuperscript{97} and in all three Baltic States.

Considering all transition economies as one group, for the decade of the 1990s, average post liberalization GDP share of their gross fixed capital formation was lower than respective shares for the year 1990 by 2-to-52% (-19%). And their capital stock declined by 2-to-29% (-16%). These declines in capital formation/stock are not a big surprise or disappointment when considered in light of the simulated decline of 2-to-17% in capital stock. These actual negative experiences are in line with our result that liberalization can entail a significant decline in the capital stock of the transition economy in order to undo the excessive investment in inefficient industries that had been undertaken in the planning era.

6. Conclusions

In this paper, we have argued that the existing disappointment with the performance of transition economies is unjustified as far as the contraction of their industries, real wages and capital formation in the 1990s is concerned. We have also shown that the initial under-performance of transition economies that had inherited more severe shortages, as in the former Soviet Republics, is to be expected.

\textsuperscript{95} This excludes the former Yugoslav Republics due to lack of data.
\textsuperscript{96} In Georgia the capital stock declined throughout the 1990s and at the end was lower by 47% than in 1990.
\textsuperscript{97} The capital stock in Uzbekistan that had fallen only by about 2% rose after 1997 and quickly passed its starting level.
Using a three-sector, three-factor general equilibrium model, we have analyzed what the transition should (theoretically) entail under ideal market conditions, given initial market distortions in these economies. Our analysis has indicated that, even under ideal market conditions, the mere correction of market disequilibria that transition economies had inherited from their planning era requires a significant decline in their real wages, while entailing a very large rise in their real returns to land and capital. It also requires a significant shift in their employment and production from manufacturing/industry to non-tradable goods and services, and a noticeable decline in their total capital stock and material usage.98

We have used simulations in our model to provide benchmarks for the actual experience of transition economies. Our conclusion is that the performance of former centrally planned economies of Eastern Europe and Soviet Republics in the first decade of their transition is far less disappointing, if not encouraging, when measured against what the mere correction of their inherited market disequilibria requires. Declines of 11-to-68% in their real wages by the late 1990s, when evaluated in light of a required decline of 16-to-42%, is far less unsatisfactory. The drop of 4-to-57% in employment shares of their industry, when considered in light of a required drop of 24-to-50%, is far less unacceptable. Declines of 10-to-55% in their GDP share of industry, when evaluated in light of a required decline of 27-to-57%, is far less surprising. Average post liberalization GDP share of their gross fixed capital formation for the decade of the 1990s being lower than the respective share for the year 1990 by 2-to-52% and their initial capital stock declines of 2-to-29% after liberalization, when considered in light of a required decline of 2-to-17% in their capital stock, should not be a disappointment.

98 The price corrections also alter foreign trade. In particular, the expansion of the non-tradables, which potentially worsens the trade balance, requires a substantial decline in the imports of the manufacturing and/or material input
The significant decline in the real wage and the large rise in the real returns to capital and land are to be expected because labor services had been grossly overpriced relative to that of capital and land under the planning system. However, this suggests any “less than ideal” market conditions that bias distribution of capital and land among the public would allow certain social groups, as owners of capital and land, to obtain substantial windfall incomes. Also, it would encourage the migration of workers to high-wage countries,\(^9\) as observed in recent years. Demonstrating again, given so many factors, their actual experience is quite encouraging.

Significant contraction of manufacturing, along with a decline in the capital stock, points to a "de-industrialization" of these economies during their transition. This initial de-industrialization is required to undo their excessive investment in inefficient industries undertaken in their planning era. The required decline in capital stock, or negative net investment, lowers not only average product wages but also the growth of these economies during their transition. The decline in their material usage is concomitant with lowering the inherited excessive material intensity of their production and improving the material efficiency of these economies.

Our analysis with its comparative static nature in effect reveals and reverses the counter-market priorities of the central planners in these economies. It reverses the priority they gave to workers, and over turns their bias in favor of their "high priority" manufactured and investment goods and against their "low priority" consumption goods and services. It allows the traditional shortage industries to expand and the consumers' demand for these goods, which had been long suppressed, to be satisfied. In terms of policy, it is important to realize how and to what degree (imperfect) markets undo “planning biases” so that biases in the other direction will not be

\(^9\) The fact that human-capital adjusted wages are very low in these countries relative to western standards is a real force...
created. That is, policy does not overshoot by going to the other extreme and favoring non-tradable goods and services at the expense of the tradable ones.

The extent of the impact on transition economies of their inherited shortages and price misalignments is determined by the absolute and relative magnitudes of these inherited disequilibria. We have used conservative values for these initial conditions, even for the case of high distortions. Thus, larger impacts than our simulation results could be expected in transition economies with most severe shortages, as in former Soviet Republics. As conservative our simulation estimates may be, they render the general performance of transition economies far less disappointing, if not encouraging, than commonly viewed. They also provide an explanation for the difference in the performance of these economies relative to one another based on the level of distortions at the start of their transition. Thus, the least distorted central European transition economies can expectedly outperform all other transition economies as they have. On the other hand, to the extent that former Soviet Republics inherited more severe shortages, their initial underperformance relative to all other transition economies is to be expected and accepted.

motivating the migration of their skilled workers.
Appendix I

A. The structural parameter definitions

\( \Theta_{ij} \): the share of factor i in the unit cost of producing commodity j (i=L,K,B for sectors M and N; i=L,A for sector B; j=M,N in the short run; j=M,N,B in the long run).

\( \lambda_{ij} \): the share of sector j in the total endowment of factor i (same definition for i and j as above).

\( \sigma_{jv} \): the elasticity of substitution between L and K in value added in sector j (j=M,N).

\( \sigma_j \): the elasticity of substitution between value added and material input in sector j (j=M, N), and the elasticity of substitution between land and labor in sector j (j=B).

\( \Phi_j \): the ratio of commodity j over national income (j=M,N,B).

\( \Phi_{Bd} \): the ratio of total material demand/usage over national income.

\( \Phi_{Bm} \): the ratio of the net import (export) of B over national income.

\( \eta_j \): the income elasticity of demand for final good j (j=M,N).

\( e^j_N \): the price elasticity of demand for final good j (j=M,N) with respect to the change in the price of N. (Where marked with a bar, it is the compensated elasticity.)
B. The parametric derivations

Totally differentiating (1)-(4) yields the impact on the commodity prices and factor returns, where

\[ p_j = \frac{\theta_{KN} \theta_{LM} - \theta_{LN} \theta_{KM}}{\theta_{LM}}, \quad p_2 = \frac{\theta_{BN} \theta_{LM} - \theta_{LN} \theta_{BM}}{\theta_{LM}}. \]

\[ w_j = \frac{\theta_{KM}}{\theta_{LM}}, \quad w_2 = \frac{\theta_{BM}}{\theta_{LM}}, \quad v_1 = \frac{\theta_{LB} \theta_{KM}}{\theta_{AB} \theta_{LM}}, \quad v_2 = \frac{\theta_{LM} + \theta_{LB} \theta_{BM}}{\theta_{AB} \theta_{LM}}. \]

Totally differentiating (5) and invoking the definition of elasticity of substitution between labor and land in B yields

\[ \hat{B} = \sigma b \theta_{LB} (\hat{W} - \hat{V}) \quad \text{(C1)} \]

Now, substituting for the respective factor price changes in this relation, the impact on B is derived.

On the factors side, totally differentiating (7), invoking the definition of elasticity of substitution between factors, and substituting for the changes in factor prices and in B from above yields

\[ \lambda_{LM} \hat{M} + \lambda_{LN} \hat{N} = (\psi_1 p_1 - \psi_2 w_1 + \psi_4) \hat{R} + (\psi_1 p_2 - \psi_3 w_2 + \psi_2) \hat{\pi} \quad \text{(C.2)} \]

where

\[ \psi_1 = \frac{\lambda_{LN} \theta_{BN} \sigma_N}{1 - \theta_{BN}}, \quad \psi_2 = -\lambda_{LB} \theta_{BM} \sigma_M \frac{\lambda_{LM} \theta_{BM} \sigma_M}{1 - \theta_{BN}} - \lambda_{LN} \theta_{BN} \frac{\sigma_N}{1 - \theta_{BN}} - \lambda_{LB} \frac{\sigma_B}{1 - \theta_{BN}}, \]

\[ \psi_3 = \lambda_{LB} \frac{\theta_{BM} \sigma_M}{\theta_{AB}} + \lambda_{LM} \frac{\theta_{KM} \sigma_M}{1 - \theta_{BN}} + \lambda_{LN} \frac{\theta_{KN} \sigma_N}{1 - \theta_{BN}} + \lambda_{LB} \frac{\sigma_B}{1 - \theta_{BN}}, \quad \psi_4 = -\lambda_{LM} \frac{\theta_{BM} \sigma_M}{1 - \theta_{BN}} - \lambda_{LN} \frac{\theta_{KN} \sigma_N}{1 - \theta_{BN}}. \]

On the goods side, considering (8), totally differentiating the demand for N, substituting for the changes in Y, in B, and in B in M and invoking the Slutsky decomposition of uncompensated price elasticities of demand as well as the definition of elasticity of substitution between factors yields

\[ o_n \hat{N} + o_m \hat{M} = (o_1 p_1 - o_3 w_1) \hat{R} + (o_1 p_2 - o_3 w_2 + o_2) \hat{\pi} + \hat{J} \quad \text{(C.3)} \]

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100 Regarding sector B with two factors one of which is sector specific, see Jones (1965) or Corden and Neary (1982); and regarding sectors M and N with three factors and weak separability, see Bruno and Sachs (1982). This allows for substituting for the changes in a_y in terms of: elasticities of substitution, factor shares in unit costs, and factor price changes.

101 This is obtained from totally differentiating (9).

102 This is obtained from totally differentiating (10).
where

\[ o_n = 1 - \eta_N (\phi_N - \lambda_{BN} \phi_B) \], \quad o_m = \eta_M (\phi_B \lambda_{BM} - \phi_M) \], \quad o_I = -\varepsilon_{NN}^N \phi_B^d \lambda_{BN} \sigma_N, \]

\[ o_2 = \eta_N (\phi_B \lambda_{BM} \sigma_M + \phi_B \lambda_{BN} \sigma_N - \phi_M + \phi_B \theta_{LB} \frac{\sigma_B}{\theta_{AB}}) \], \quad o_3 = -\eta_N \phi_B \theta_{LB} \frac{\sigma_B}{\theta_{AB}}. \]

Considering (C.2) and (C.3) simultaneously, the output changes in sectors M and N are obtained, where

\[ D = \lambda_{LM} o_n - \lambda_{LN} o_m, \quad m_r = (o_n \psi_1 - \lambda_{LN} o_1) \rho_1 - (o_n \psi_3 - \lambda_{LN} o_3) \omega_1 + o_n \psi_4 \]

\[ m_r = (o_n \psi_1 - \lambda_{LN} o_1) \rho_2 + (o_n \psi_2 - \lambda_{LN} o_2) - (o_n \psi_3 - \lambda_{LN} o_3) \omega_2 \]

\[ n_r = (\lambda_{LM} o_1 - o_m \psi_1) \rho_1 - (\lambda_{LM} o_3 - o_m \psi_3) \omega_1 - o_m \psi_4 \]

\[ n_r = (\lambda_{LM} o_1 - o_m \psi_1) \rho_2 + (\lambda_{LM} o_2 - o_m \psi_2) - (\lambda_{LM} o_3 - o_m \psi_3) \omega_2 \]

Absolutely differentiating \( L_B = a_{LB} B \), \( L_M = a_{LM} M \), and \( L_N = a_{LN} N \), invoking the definition of elasticity of substitution between factors, substituting for the changes in sectoral outputs from above, the impact on the sectoral employment are derived, where

\[ c_1 = \frac{\theta_{KM} \sigma_{MV}}{1 - \theta_{BM}}, \quad c_2 = \frac{\theta_{BM} \sigma_M}{1 - \theta_{BM}}, \quad c_3 = -\frac{\theta_{KN} \sigma_{NV}}{1 - \theta_{BN}}, \quad c_4 = -\frac{\theta_{BN} \sigma_N}{1 - \theta_{BN}}. \]
Appendix II

Choice of structural parameter values and initial conditions

The tradables/non-tradables sectoral dividing lines used in Goldstein and Officer (1979) are followed here.

The parameter values chosen are averages directly taken from the statistical data on East European countries or are derived from such data, all in consultation with certain studies. The data of Bulgaria, Czechoslovakia, (former) East Germany, Hungary, Poland, and (former) Soviet Union (including Ukraine) are primarily used, due to their availability.

The sectoral shares in labor endowment/force ($\lambda_{Ljs}$) are based on the CIA's The World Factbook 1990. The sectoral shares in capital endowment/stock ($\lambda_{Kjs}$) and in material endowment/usage ($\lambda_{Bjs}$) are based on the United Nation's (1990) National Accounting.

The factor shares in unit costs ($\Theta_{ijs}$) are obtained by drawing on: Marer et al. (1992); Kushnirsky (1993); Desai (1987); and the United Nation's (1990) National Accounting.104

The sectoral shares in GDP ($\Phi_{js}$ and $\Phi_M^B$) are based on: Marer et al. (1992); Corbo et al. (1991); and the CIA's (1989) Handbook of Economics Statistics.

The elasticities of substitution between production factors ($\sigma_{jVs}$ and $\sigma_{js}$) are based on: Kushnirsky (1993); Desai (1987); Weitzman (1970); and Berndt and Wood (1975). The price and income elasticities of demand ($\epsilon_{ijs}$ and $\eta_{js}$) are based on: Walker (1989); and Spencer & Amos (1993).105

The initial conditions on material price and domestic interest rate are mainly based on Calvo and Coricelli (1992), Commander (1992), and Lipton and Sachs (1990). There is no data/estimates on the actual size of the shortage for the non-tradables as a whole in the former centrally-planned economies. Its size (of 20% and 50%) is chosen here based on the long wait period for housing and public utilities even in the best of planned economies and by the near total neglect for demand for such products in some of the former Soviet Republics. As we double the values of these initial conditions, the change in almost all variables doubles.

The initial capital stock for 1990 is computed, partially following Easterly and Levine (2001), by estimating the respective initial capital-output ratio, k, and multiplying it by the real output in 1990. We assume that the transition economies were at their steady-state capital-output ratios in 1990. This renders the initial k equal to $i/(g+d)$, where i is the real investment output ratio, g is the growth rate of output, and d is the capital depreciation rate, all at their steady-state values. The parameter d is set at 0.07 as in Easterly and Levine (2001), g is set at 0.03 in light of the long-term growth performance of these economies prior to 1990s, and i is set at the average real investment rate of all the countries in our study in 1990.106

103 For more details, see Fardmanesh and Tan (2000).
104 Kushnirsky (1993) and Desai (1987) estimate labor and capital shares in unit cost from two-factor CES production functions for Ukraine economy and Soviet economy respectively.
105 As these studies are on market economies, the planned economies are assumed fundamentally similar to the market economies with respect to the demand side or the consumers' preferences.
106 It would be preferred theoretically to use for g and i average output and average real investment rates for several years in the 1990s as in Easterly and Levine (2001). However, applying such an approach here, even when using the averages for the entire decade of 1990s, would further bias our estimates because most transition economies experienced a downturn for this entire period.
References


Rosati, D., 1994. Output decline during transition from plan to market, Economics of Transition 2, 419-442.

Sorm, V., Terrell, K., 2000. Sectoral restructuring and labor mobility: A comparative look at
the Czech Republic, Journal of Comparative Economics 28, 431-455.


Table 1: The parameter values used in simulations\(^ {107} \)

**Production side:**

<table>
<thead>
<tr>
<th>Sectoral shares in factor endowments:</th>
<th>Production technology:</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \lambda_{LM} = 0.36 )</td>
<td>( \sigma_{MV} = 0.2 ) (L &amp; K in V of M)</td>
</tr>
<tr>
<td>( \lambda_{LN} = 0.45 )</td>
<td>( \sigma_M = 0.1 ) (V &amp; B in M)</td>
</tr>
<tr>
<td>( \lambda_{LB} = 0.19 )</td>
<td>( \sigma_{NV} = 0.2 ) (L &amp; K in V of N)</td>
</tr>
<tr>
<td>( \lambda_{KM} = 0.39 )</td>
<td>( \sigma_N = 0.1 ) (V &amp; B in N)</td>
</tr>
<tr>
<td>( \lambda_{KN} = 0.61 )</td>
<td>( \sigma_B = 0.1 ) (L &amp; A in B)</td>
</tr>
<tr>
<td>( \lambda_{BM} = 0.60 )</td>
<td></td>
</tr>
<tr>
<td>( \lambda_{BN} = 0.40 )</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor shares in unit costs:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( \theta_{LM} = 0.66 )</td>
<td>( \theta_{LB} = 0.42 )</td>
</tr>
<tr>
<td>( \theta_{LN} = 0.71 )</td>
<td>( \theta_{AB} = 0.58 )</td>
</tr>
<tr>
<td>( \theta_{KM} = 0.13 )</td>
<td>( \theta_{KN} = 0.14 )</td>
</tr>
<tr>
<td>( \theta_{BN} = 0.15 )</td>
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</tr>
</tbody>
</table>

**Demand side:**

<table>
<thead>
<tr>
<th>Sectoral shares in GDP:</th>
<th>Price and income elasticities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Phi_M = 0.56 )</td>
<td>( \zeta_N ) = 0.7</td>
</tr>
<tr>
<td>( \Phi_N = 0.49 )</td>
<td>( \eta_N = 1.2 )</td>
</tr>
<tr>
<td>( \Phi_B = 0.05 )</td>
<td>( \eta_M = 0.9 )</td>
</tr>
<tr>
<td>( \Phi_B = 0.19 )</td>
<td></td>
</tr>
</tbody>
</table>

---

\(^{107}\) These parameter values are mostly derived from the statistical data of Bulgaria, Czechoslovakia, (former) East Germany, Hungary, Poland, and (former) Soviet Union (including Ukraine); see Appendix II.
Table 2: The simulation results

<table>
<thead>
<tr>
<th>Δ% in</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_N</td>
<td>-2</td>
<td>-6</td>
<td>0</td>
<td>0</td>
<td>-2</td>
<td>-6</td>
<td>-2</td>
<td>-6</td>
</tr>
<tr>
<td>P</td>
<td>-1</td>
<td>-3</td>
<td>0</td>
<td>0</td>
<td>-1</td>
<td>-3</td>
<td>-1</td>
<td>-3</td>
</tr>
<tr>
<td>W</td>
<td>-17</td>
<td>-45</td>
<td>0</td>
<td>0</td>
<td>-17</td>
<td>-45</td>
<td>-10</td>
<td>-25</td>
</tr>
<tr>
<td>V</td>
<td>+64</td>
<td>+171</td>
<td>0</td>
<td>0</td>
<td>+64</td>
<td>+171</td>
<td>+59</td>
<td>+156</td>
</tr>
<tr>
<td>W/P</td>
<td>-16</td>
<td>-42</td>
<td>0</td>
<td>0</td>
<td>-16</td>
<td>-42</td>
<td>-8</td>
<td>-22</td>
</tr>
<tr>
<td>V/P</td>
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<td>+174</td>
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<td>0</td>
<td>+65</td>
<td>+174</td>
<td>+60</td>
<td>+159</td>
</tr>
<tr>
<td>R/P</td>
<td>+41</td>
<td>+103</td>
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<td>0</td>
<td>+41</td>
<td>+103</td>
<td>+11</td>
<td>+35</td>
</tr>
<tr>
<td>N</td>
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<td>+17</td>
<td>+54</td>
<td>-1</td>
<td>-3</td>
<td>-1</td>
<td>-2</td>
</tr>
<tr>
<td>B</td>
<td>+3</td>
<td>+9</td>
<td>0</td>
<td>0</td>
<td>+3</td>
<td>+9</td>
<td>+3</td>
<td>+8</td>
</tr>
<tr>
<td>K</td>
<td>-2</td>
<td>-17</td>
<td>+2</td>
<td>-5</td>
<td>-4</td>
<td>-12</td>
<td>-2</td>
<td>-7</td>
</tr>
</tbody>
</table>

108 The discrepancy across certain rows is due to rounding the figures. The respective impacts on B_d are declines of 11-to-16, 6-to-4, 5-to-12, and 3-to-7.
Table 3: The actual and expected key performances

<table>
<thead>
<tr>
<th>Performance indicator</th>
<th>Actual (Range in %)</th>
<th>Benchmark (expected) Low to high initial distortion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real wage (-)</td>
<td>11 to 68</td>
<td>16 to 42</td>
</tr>
<tr>
<td>Manufacturing employment (-)</td>
<td>4 to 57</td>
<td>24 to 50</td>
</tr>
<tr>
<td>Manufacturing output/GDP (-)</td>
<td>10 to 55</td>
<td>27 to 57</td>
</tr>
<tr>
<td>Capital stock (-)</td>
<td>2 to 29</td>
<td>2 to 17</td>
</tr>
</tbody>
</table>

