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YALE UNIVERSITY

**P.O. Box 208269
27 Hillhouse Avenue
New Haven, CT 06520-8269**

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**WAGE AND PRICE CONTROL POLICIES
IN SOCIALIST TRANSITIONAL ECONOMIES**

**Mohsen Fardmanesh
Temple University**

**Li Tan
The WEFA Group**

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ABSTRACT

This paper studies the structural impact of wage and price control policies in socialist transitional economies using a two-sector three-factor small open economy model. It illustrates the results quantitatively via simulation exercises. At the earlier stage of the transition when labor is immobile, a strict control on the price of the non-tradables and the wage rate minimizes the fall in employment and output. Also, a more severe control on the price of the non-tradables than on the wage rate alleviates the fall in the real wage at negligible costs in lost employment and output. At the later stage of the transition when labor becomes mobile, the liberalization of the price of the non-tradables can proceed faster than that of the wage rate. This policy combination increases employment and output and reduces the shortage for the non-tradables, but lowers the real wage.

KEY WORDS: LIBERALIZATION, STRUCTURAL ADJUSTMENT, PRICE POLICY,
WAGE POLICY, SOCIALIST TRANSITIONAL ECONOMIES

1. INTRODUCTION

There have been numerous studies on the socialist transitional economies, covering various aspects of their transition to a market economy. For example, Bossak (1991) and Bofinger (1991) study exchange rate and trade policy; Calvo & Frenkel (1991) probe development of a financial market and reform of banking system; Commander & Coricelli (1992) and Lipton & Sachs (1990) study price liberalization; McKinnon (1991, 1993) analyzes the financial control in the transition to a market economy; Polak (1991) and Williamson (1991) address currency convertibility; and Tanzi (1991) discusses fiscal issues in the transitional process.

Because of the central role of macro stability at the initial stage of the transition, most of the existing studies on the socialist transitional economies have focused on the initial inflation (stagflation) outcome of their liberalization (e.g., Calvo and Coricelli (1992), Cochrane and Ickes (1991), Commander (1992), Commander and Coricelli (1992), Dornbusch (1992), Lipton and Sachs (1990), and Naughton (1991)).¹ The immediate impact of the price liberalization is domestic inflation.² The immediate impact of trade liberalization, which requires convertibility of currency and freeing of the exchange rate, is large devaluation of the overvalued domestic currency. This is inflationary as well.

It is recognized that sudden liberalization of all domestic prices without, among others, domestic capital market and new tax system in place, could result in run-away inflation (McKinnon, 1993).³ Consequently, at the initial stage of the liberalization government control over certain (producer) prices and wage rate becomes necessary for maintaining price stability. The price-wage control not only anchors the overall price level, as argued by McKinnon, but also maintains the surplus profit as the tax source for government revenue by preserving the "distorted" relative price structure of

¹ Exceptions to this focus are, among others, McKinnon (1991) and Svejnar (1991).

² In the Polish big bang, Ministry of Finance officials estimate that prices rose 112% from the end of December 1989 to the end of January 1990 (Lipton and Sachs, 1990).

³ It should be noted that in the case of Poland full liberalization did not lead to run-away inflation. However, Poland concurrently made a significant progress on both fronts of domestic capital market and tax system.

the planning era.⁴

While the price-wage control policies serve important macro economic functions, they also have great impacts on the adjustment of the real economy, namely, the sectoral employment and production. This paper studies the structural impact of these policies in a "controlled liberalization" of socialist transitional economies.⁵ The analysis is based on a two-sector three-factor small open economy (SOE) model with two policy rules of a wage indexation scheme and a regulation on the price of the non-tradables.⁶ All results are illustrated quantitatively via simulation exercises.

This paper reveals the important micro role of the price-wage control policies at the early stage of the liberalization in the "real adjustment" of the transitional economy. It demonstrates that, with labor immobile at the initial stage of the liberalization,⁷ a strict control on the price of the non-tradables and the wage rate could minimize the fall in employment and production in the contracting manufacturing sector. Furthermore, a more severe control on the price of the non-tradables than on the wage rate is preferred, since it alleviates the fall in the real wage at negligible costs in lost employment and output. As the labor market develops and labor becomes mobile between regions and industries, the price-wage controls should be phased out. The liberalization of the price of the non-tradables

⁴ The efficiency costs and general limitation of such controls are to be noted. For example, Romania which adopted half-measures has experienced both low growth and high unemployment. For the problems of limited market-oriented reform, see Wolf (1991).

⁵ Some former centrally-planned economies tried to adopt a cold-turkey approach and to embrace quick and full liberalization. However, in most cases the public's discontent with the economic results of the relatively uncontrolled liberalization (e.g., high inflation and unemployment) has resulted in a policy reversal and even in the political return of some "old guards". This paper provides a rational economic framework for such emerging cases of "controlled liberalization".

⁶ This model is an extension of the short-run model in Fardmanesh and Tan (1995). This micro-economic model focuses on the immobility of labor, and does not include the macro-economic consequences of alternative wage-price control policies.

⁷ For clarity in arguments we consider the two extreme cases of "perfect labor immobility and mobility", and the insights provided are valid for the more realistic cases of "less and more mobile labor" as well.

should proceed faster than that of the wage rate, since a low real product wage in the non-tradable goods sector is essential to induce more employment and output in this expanding sector.

The rest of the paper is organized as follows. The rationale behind price-wage control policies is discussed in section 2. Section 3 presents the model and the theoretical analysis. The simulation analysis is presented in sections 4. Section 5 summarizes the findings of the study. The complete definition of certain parameters are presented in the Appendix.

2. THE CONTEXT OF WAGE-PRICE CONTROL POLICIES

Under planning, relative prices had been heavily distorted. The material inputs were underpriced; and the economy traded them at below their world prices with other socialist countries within their trading block (CMEA). The manufactured goods were priced above their respective world prices. The price of the non-tradable goods were set irrationally low or below the "would-be" market equilibrium price, as evidenced by chronic severe shortages in this sector.⁸

With a complete price and trade liberalization, the price of the material inputs and of the non-tradable goods would rise relative to the price of the manufactured goods. Assuming markets, especially, labor market, are well-developed, the employment and output in the non-tradable goods sector would rise and those in the manufactured goods sector would fall. But, in reality, this market equilibrium outcome does not emerge at the early stage of the transition for the following reasons. Firstly, the resulting inflation creates uncertainty about relative prices and, hence, blurs the price signals. Secondly, in the absence of market institutions at the initial stage of the liberalization, the economy may not respond accordingly to the price signals even if they are clearly conveyed.

Lack of labor market or labor immobility is very typical of socialist transitional economies.

⁸ Because of this Kornai's (1980) "shortage economy" has stood as another name for the (former) planned economies.

Under the planning system, labor had been allocated through administrative measures for decades. Moreover, socialist firms had internalized various economic functions which are carried out by markets in market economies. Typically, socialist firms provided institutionally-owned housing, doctor's office, day nursery, canteens, activity centers, etc., for their employees (Kornai, 1992). With production as the top priority, socialist firms could obtain very limited funds from the planning authority each year for investment in these "non-production" areas. Over the years, chronic shortages had developed and accumulated in all these facilities. Therefore, as the transition begins, the ex-socialist firms with the planning legacy cannot behave exactly like their counterparts in the market economies. They are "crippled" in their response to the price signals, especially in the labor market. As the relative price of the non-tradable goods increases, or the real product wage falls in this sector, the firms in this sector are very slow in raising their demand for labor. Because a firm's ability to hire new workers is severely constrained by its capacity to provide for them in the absence of the corresponding markets for housing, etc. The sluggish response of the firms in the labor market creates a very steep short-run supply curve for the non-tradable goods. It means that the price liberalization in the non-tradable goods market only results in a big increase in the price of the non-tradable goods, but little increase in their production.

Considering the entire economy, the relative price changes resulting from the liberalization could manifest itself only in one direction: the employment and output in the manufactured goods sector would go down since it is easier for firms to lay off workers. Yet, the employment and output in the non-tradable goods sector will not go up. As a matter of fact, the output and employment in this sector could fall as well, if the negative effect on the production in this sector of the higher material price is not fully counteracted by the positive effect on the production in this sector of the higher price for the non-tradables. In this case, the output would fall in both sectors, and there could be unemployment in both sectors. In addition, the overall real wage would fall more, since the increase in

the price of the non-tradable goods is much greater than that in the market equilibrium outcome.⁹

In sum, since market institutions and price liberalization are introduced simultaneously at the initial stage of the transition, the former could hardly be adequately developed to accommodate the latter. Until some of the previous functions of the firms are externalized by the development of the related markets, the firms' responsiveness remains restricted and labor will stay immobile. Therefore, the structural adjustment in employment and production predicted by the market equilibrium outcome would not follow the price and trade liberalization.

In a more realistic case, the government either opts, or is forced, to maintain controls on prices of certain "traditional shortage" goods, such as utility, transportation, housing... as well as on the wage rate. The degree and scope of price-wage control may vary from country to country. But some control exists in all cases of socialist transitions from Polish Big Bang to Chinese Gradualism.¹⁰ As mentioned above, the price-wage control is imposed for macro purposes. Yet it has important implications in terms of the "real adjustment" of the economy, which is the focus of this paper. The analysis will be conducted through the SOE model introduced below.

3. THE MODEL AND THE THEORETICAL ANALYSIS

The Production Side¹¹

We assume that the economy produces two final commodities: a traded good (M) and a non-traded good (N), both produced with labor (L), capital (K) and a traded material input (B). Capital is

⁹ This explains well the uniform decline in the output and employment across sectors, as well as the sharp fall in the real wage, at the initial stage of the transition in the Eastern European economies and in Russia.

¹⁰ For example, see Coricelli and Revenga (1992) for wage policy in Poland during 1990-91.

¹¹ The modelling of the production side basically follows Jones' (1971) "2 by 2" general equilibrium framework, although a third production factor, the material input, is added in both sectors through nested production functions, as in Bruno & Sachs (1985).

sector specific, while labor is initially immobile but becomes perfectly mobile in due time. The economy has a fixed endowment of all inputs including B,¹² as our analysis is short run in nature.

The production process in the two sectors are described by:

$$M = M(V_M(L, K_M), B) \quad (1)$$

$$N = N(V_N(L, K_N), B) \quad (2)$$

Both final goods M and N are produced with two-level CES production functions, where weak separability is assumed. M and N, which henceforth denote the supply of the respective two goods, are linearly homogenous in value added (V) and material input (B); and V, in turn, is linearly homogenous in labor (L) and capital (K).

The definition of factor full employment for where the economy ends up can be stated as:

$$a_{KM}M = K_M \quad (3)$$

$$a_{KN}N = K_N \quad (4)$$

$$a_{BM}M + a_{BN}N = B \quad (5)$$

$$a_{LM}M + a_{LN}N = L \quad (6)$$

where a_{ij} is the quantity of i ($i=L, K, B$) required to produce a unit of commodity j ($j=M, N$). It should be noted that equation (5) is an identity stating the economy-wide demand for the material input, and

¹² Alternatively, as in Fardmanesh and Tan (1995), B can be produced with land and labor, while land and labor are non-substitutable in the short run. Then, given the rise in the price of B is sufficient to entail full utilization of the land endowment, the domestic production of B is fixed at its maximum. We suppress sector B here because modelling it explicitly does not change the insights provided by our current analysis.

that equation (6) holds when perfect labor mobility is achieved.

The profit-maximization conditions can be represented by:

$$a_{LM}W + a_{KM}R_M + a_{BM}\pi = P_M \quad (7)$$

$$a_{LN}W + a_{KN}R_N + a_{BN}\pi = P_N \quad (8)$$

where W is the return to labor, R_M and R_N are the returns to capital in sectors M and N, respectively; and P_M , P_N , and π are the prices of M, N, and B, respectively.

As in all SOE models, the domestic market for the non-tradable goods market determines their price, while the prices of the tradables are given by the world market. Throughout the analysis, P_M is used as the numeraire ($P_M=1$), and a circumflex ($\hat{\cdot}$) denotes a proportional rate of change, i.e. $\hat{x} = dx/x$.

From the above, we can express the changes in the labor demand and production in each sector as a function of the changes in P_N , the price of N; π , the price of B; and W , the wage rate.

The changes in labor demand in sectors M and N are given by:

$$\hat{L}_M = -(1 - \theta_{BM}) \frac{\sigma_{MV}}{\theta_{KM}} \hat{W} - \theta_{BM} \frac{\sigma_{MV}}{\theta_{KM}} \hat{\pi} \quad (9)$$

$$\hat{L}_N = \frac{\sigma_{NV}}{\theta_{KN}} \hat{P}_N - (1 - \theta_{BN}) \frac{\sigma_{NV}}{\theta_{KN}} \hat{W} - \theta_{BN} \frac{\sigma_{NV}}{\theta_{KN}} \hat{\pi} \quad (10)$$

where σ_{jv} is the elasticity of substitution between L and K in sector j; θ_{ij} is the share of factor i in the unit cost in sector j; and λ_{ij} is the share of sector j in the total endowment of factor i (in all cases,

$i=L,K,B$ and $j=M,N$). The change in labor demand in each sector is negatively related to the changes in its real product wage and in its real product material cost.

The output changes in each sector, on the supply side, are derived as:¹³

$$\hat{M} = -d_2 \hat{W} - d_3 \hat{\pi} \quad (11)$$

$$\hat{N} = a_1 \hat{P}_N - a_2 \hat{W} - a_3 \hat{\pi} \quad (12)$$

The change in output in each sector is negatively related to the changes in its real product wage and in its real product material cost, as is the case with the changes in the sectoral labor demand.

The Demand Side

The demand for the two final goods M and N is a function of their (relative) prices and (real) national income.¹⁴ In addition, the economy inherits a shortage of J units for good N from the planning era. The chronic shortage for the non-tradables under planning is accounted for explicitly, as in Fardmanesh and Tan (1995).

The domestic demand for the two goods are described by:¹⁵

$$M^d = M^d(P_N, Y) \quad (13)$$

$$N^d = N^d(P_N, Y) \quad (14)$$

¹³ See APPENDIX (A.1) for the complete definition of the parameters.

¹⁴ In addition to Fardmanesh and Tan (1995), Fardmanesh (1990) and Corden and Neary (1982) also model demand in this way.

¹⁵ The demand for M is expressed as a function of the relative price of N to M because P_M is the numeraire.

where national income, Y ,¹⁶ is:

$$Y = M + P_N N - \pi(B - B_H) \quad (15)$$

where B is the total usage of the material input in the entire economy, and B_H is the (fixed) domestic endowment of material input. The term $\pi(B - B_H)$ shows the net import of the material input in units of M ; and is positive for a net importer of material and negative for a net exporter of material.¹⁷

From the above, the changes in the demand for each good are derived as:¹⁸

$$\hat{M}^d = \delta_0 \hat{P}_N + \eta_M \delta_2 \hat{W} + \eta_M \delta_3 \hat{\pi} \quad (16)$$

$$\hat{N}^d = \delta_1 \hat{P}_N + \eta_N \delta_2 \hat{W} + \eta_N \delta_3 \hat{\pi} \quad (17)$$

The change in the demand for the manufactured good is positively related to the change in the price of the non-tradable good, and is negatively related to the changes in the wage rate and in the price of the material input. The change in the demand for the non-tradable good is negatively related to the changes in its own price, the wage rate, and the price of the material input, all prices measured in terms of the manufactured good. It should be noted that an increase in the wage rate or in the material price discourages demand for both goods by raising their prices as well as by reducing national output and income.

Following the tradition of SOE models, the final tradable good M is treated as a composite good of the exportables and the importables. But the domestic demand for and domestic supply of good M need not equal. The economy-wide demand for B and the domestic endowment of B need not

¹⁶ As our definition of Y implies, net foreign earnings and capital depreciation are assumed zero.

¹⁷ By empirical evidence, the East European economies are net importers of material.

¹⁸ See Appendix (A.2) for the complete definition for the parameters.

equal either. The rest of the world is buying from and selling to the economy any quantity of good M and of material input B that she wishes to trade at the existing world prices, following the small country assumption. However, the overall trade in M and B must be balanced, as the trade balance is assumed exogenous and set at zero.¹⁹

By contrast, the domestic demand for and supply of the final non-tradable good N must ultimately equal by definition. This and the existence of a shortage of J units of good N inherited from the planning era imply the following market clearing condition:²⁰

$$\hat{N} = \hat{N}^d + \hat{J} \quad (18)$$

where the last term \hat{J} represents the inherited shortage for good N as a percentage of the equilibrium quantity of good N.

The Government Policy Rules

We assume that the government macro policy, designed to curb the (open) inflation, includes a wage indexation scheme and a regulation on the price of the non-tradable good.

For the wage indexation scheme, we assume that the government follows a wage-setting rule which can be described by:

$$\hat{W} = \alpha * [\Phi_N \hat{P}_N + (1 - \Phi_N) \hat{P}_M] \quad (19)$$

where Φ_N is the expenditure share of the non-tradable good in national income, $0 < \Phi_N < 1$; the equation in [] is a weighted average of \hat{P}_N and \hat{P}_M , standing for the change in the general price level

¹⁹ A trade deficit with an impact on consumption only strengthens the policy insights derived here, as it reinforces the role played by the shortage for the non-tradables.

²⁰ This is dictated by the respective pre- and post-liberalization market clearing conditions of $N_{Pre} + J = N_{Pre}^d$ and $N_{Post} = N_{Post}^d$.

(\mathbf{P}); α is the "indexation" coefficient of the wage rate with respect to the inflation rate, $0 < \alpha < 1$. It is assumed that the government can set α to control the growth of the wage rate.

For the regulation of the price of the non-tradable good, we assume that the government set the administered price of N by applying the following rule:

$$\hat{P}_N = g\hat{\pi} \quad (20)$$

where g ($0 < g < 1$) is the "peg" coefficient of the price of the non-tradable good with respect to the material input price. Thus, we assume that the government allows the price of the non-tradable good to rise proportionally to the increase in the material input price.

We can now obtain the impact on the key economic variables of a liberalization subject to government wage-price control policies, by feeding the above policy-determined \mathbf{W} and \mathbf{P}_N back into our SOE model solutions derived above. The sectoral real product wage, the economy-wide real wage, the sectoral employment and output, and the excess demand for the non-tradable good all become functions of policy variables α and g , as well as of the rise in the material price ($\hat{\pi} > 0$).

The change in the real product wage in sector M, under the policy rules, is calculated as follows:

$$\hat{W} = \alpha\phi_N g\hat{\pi} \quad (21)$$

Clearly, for any value of α and g between 0 and 1, the real product wage in M rises. α and g work in the same direction in determining the real product wage in sector M. Either an increase in the value of α , or an increase in the value of g , will push up the real product wage in M. The reason is straight forward. The policy parameter g is the "peg" coefficient of the price of the non-tradable good with respect to the material input price. For a given increase in π , a higher g leads to a higher price for the non-tradable good which in turn pushes up the overall price level proportionately. A higher overall

price level raises the wage rate for given α , thus raising the real product wage in sector M unambiguously. The policy parameter α is the indexation coefficient of the wage rate with respect to the overall price level. An increase in the value of α , for a given value of g , pushes up the wage rate, and, thus, the real product wage regardless of sector.

The change in the real product wage in sector N, under the policy rules is calculated as follows:

$$\hat{W}-\hat{P}_N=(\alpha\phi_N-1)g\hat{\tau} \quad (22)$$

By contrast, the real product wage in sector N will fall in any policy range, that is, as long as α and g are between 0 and 1. Note that α and g work in opposite directions in determining the real product wage in sector N. An increase in α pushes up the real product wage by raising the wage rate. An increase in g , however, reduces the real product wage in sector N by increasing the price of the non-tradable good. Therefore, the higher the value of α and the lower the value of g , the larger the increase in the real product wage in sector N.

The change in the overall real wage, under these rules, is expressed by:

$$\hat{W}-\hat{P}=(\alpha-1)\phi_Ng\hat{\tau} \quad (23)$$

Just as with the determination of the real product wage in sector N, the overall real wage falls within all policy range, that is, for any value of α and g between 0 and 1. Also similar to the determination of the real product wage in sector N, α and g work in the opposite directions in determining the overall real wage. The only difference is the magnitude of the change. For any given pair of α and g , the change in the real product wage in sector N is always bigger than the change in the overall real wage.

The changes in employment in sectors M and N are expressed respectively as:

$$\hat{L}_M = -\frac{\sigma_{MV}}{\theta_{KM}} [(1-\theta_{BM})\alpha\phi_N g + \theta_{BM}] \hat{\pi} \quad (24)$$

$$\hat{L}_N = \frac{\sigma_{NV}}{\theta_{KN}} [g - (1-\theta_{BN})\alpha\phi_N g - \theta_{BN}] \hat{\pi} \quad (25)$$

The change in the employment in each sector is negatively related to that in its real product wage and in its real product material cost, as mentioned before.

The employment in sector M falls within all policy range (for $0 < \alpha < 1$ & $0 < g < 1$), because both its real product wage and its real product material cost increase. Again, α and g work in the same direction. A higher value of either α or g will intensify the fall in the employment in sector M, because they push up the real product wage in M.

The change in the employment in sector N is uncertain, because the real product wage in sector N falls and the real product material cost in this sector rises. Thus the direction of the change in employment in sector N can be determined by the value of the policy variables: α and g . An increase in the value of g or a decrease in the value of α will improve (help increase) the employment in this sector, because both measures further depress the real product wage in N. Strictly speaking, for the employment in sector N to go up, certain combinations of values for g and α are required such that the term in the bracket in equation (25) is positive.

The change in the supplies of M and N are, respectively:

$$\hat{M} = -\frac{1}{1-\theta_{BM}} [(1-\theta_{BM})\theta_{LM}\alpha\phi_N g \frac{\sigma_{MV}}{\theta_{KM}} + \theta_{BM}\theta_{LM} \frac{\sigma_{MV}}{\theta_{KM}} + \theta_{BM}\sigma_M] \hat{\pi} \quad (26)$$

$$\hat{N} = \frac{1}{1-\theta_{BN}} \left[\frac{\sigma_{NV}}{\theta_{KN}} - (1-\theta_{BN}) \frac{\sigma_{NV}}{\theta_{KN}} \alpha \phi_N - \theta_{BN} \frac{\sigma_{NV}}{\theta_{KN}} - \theta_{BN} \sigma_N (1-g) \right] \hat{\pi} \quad (27)$$

The output in each sector is positively related to its employment and is negatively related to the price of the material inputs, in the rate-of-change form. The production in sector M falls in all policy ranges, because its employment falls while the price of the material input rises. The change in the output in sector N, again, depends on the value of the policy variables. The impact of a rising price of the material input is always negative on the production of N. But the employment can be affected positively or negatively by policy variables. An increase in the value of g or a decrease in the value of α will push up the output of N because both measures help increase the employment in sector N.

The changes in the demands for M and N are:²¹

$$\hat{M}^d = (\delta_0 g + \eta_M \delta_2 \alpha \phi_N g + \eta_M \delta_3) \hat{\pi} \quad (28)$$

$$\hat{N}^d + \hat{J} = (\delta_1 g + \eta_N \delta_2 \alpha \phi_N g + \eta_N \delta_3) \hat{\pi} + \hat{J} \quad (29)$$

The term \hat{J} represents the inherited shortage, as explained above.

Policy variable g is the "peg" coefficient of P_N with respect to π . So the higher the value of g is, the larger the increase in the price of the non-tradable good would be. An increase in g tends to increase the demand for M through the substitution effect, while it decreases the demand for N through the own-price effect.

Policy variable α , as the "indexation" coefficient for wage rate, affects the demand for M and N indirectly through a long secondary chain. So its effect on the demand side is negligible. For given g , a higher α depresses the demand for N mainly through the national income channel. A higher α

²¹ See Appendix for the complete definition of the parameters.

discourages the production of M through higher real product wage in sector M, thus it reduces the demand for N by lowering national income.

Unlike the market equilibrium analysis in which the demand for and supply of N are equal in equilibrium, here, with the government price-wage rules in effect, the demand and supply of N are different and are derived separately. The policy-determined P_N does not equate the demand and supply of N. By the same token, the policy-determined W does not equate the demand and supply of labor. Therefore, unlike in the market equilibrium case in which both the labor and the non-tradable good market clear, in the wage-price control policies case we have unemployment in the labor market and excess demand (or supply) in the non-tradable good market.²²

4. THE SIMULATION ANALYSIS

The structural impact of government wage-price control policies in the transition process is now explored quantitatively via simulation exercises. The set of parameter values are presented in Table 1; and the initial conditions $\hat{\pi}$ and \uparrow are set at 30% and 50% respectively, assuming that the price of the material input goes up by 30% after the liberalization and the inherited shortage for the non-tradable good is 50% of its market clearing value.²³ Since the government has choices over the values of α and g , we vary their values between the range of 0 to 1 to reveal the impact of different

²² It should be noted that in the wage-price control policies case the persisting disequilibrium in the labor and the consumer goods markets can cause households to supply less labor resulting in zero open unemployment, as observed in Romania in 1989. This macro effect of the wage-price control policies on the labor supply is not modelled here; and the supply of labor under no distortions constitutes the benchmark against which the (suppressed) unemployment during the controlled transition is measured.

²³ We use the same values here as in Fardmanesh and Tan (1995). The structural parameter values are derived from the statistical data of Bulgaria, Czechoslovakia, (former) East Germany, Hungary, Poland, and (former) Soviet Union (including Ukraine); and the initial conditions are set at an "average" minimum value using the actual experience of socialist transitional economies.

policy combinations.²⁴ The value of the variable in question would change with each combination of α and g . The variables of interest are: the real wages, the sectoral employment and output, and the excess demand for N.

A distinction between the cases of labor immobility and labor mobility is drawn throughout the analysis. This distinction is especially important for policy making, because policies based on the assumption of labor mobility may not work, or work in an opposite direction when labor is immobile.

We assume that with immobile labor, firing is feasible for firms while hiring is not; with mobile labor, both firing and hiring are feasible. In the case of labor immobility, firms in sector N are not able to respond to the increase in P_N by raising their employment and production. Yet firms in sector M respond to the decline in the relative price of M by cutting back their employment and production. Thus unemployment arises and the output of the entire economy falls since the production in sector M falls yet that in sector N remains unchanged.²⁵ In the case of labor mobility, both sectors respond. Firms in sector N will be hiring workers to expand and firms in sector M will be firing workers to contract. Thus the fall in the employment and production in sector M would be offset by a rise in those in sector N, and, depending on the parameter values, the total employment and output of the economy would rise toward full employment.

The Impact on Real Wages

The real wage falls within the whole policy range ($0 < \alpha < 1$, $0 < g < 1$), while the real product wage in sector M rises and that in sector N falls. Yet the government can regulate the magnitude of these changes by choosing different values for α and g .

²⁴ For clarity of graphs and visual convenience, we consider the range of .2 to 1. In the range of 0 to .2 the graphic results of various policy scenarios are too close for visual distinction.

²⁵ The rise in π calls for a contraction in sector N. But, in light of the dominating expansionary impact of the shortage for N, the employment and output in sector N would not fall unless the price of N is not allowed to rise at all or not enough to cover for the higher unit material cost. Such perverse price policies are ruled out here.

An increase in g , for given α , will always intensify the fall in the real product wage in N and the fall in the overall real wage; it magnifies the rise in the real product wage in sector M, regardless of mobility of labor.

The policy implication for the real wage is standard in the case of labor mobility. The policy makers could choose between a lower real wage and a lower employment rate. In other words, lower unemployment or less loss in output can only be obtained by lowering the real wage.

The higher the g value and the lower the α value, the lower the overall real wage. A lower overall real wage would always improve overall employment with labor mobility. A falling overall real wage indicates that the fall in the real product wage in N must exceed the rise in the real product wage in M. As a result, the employment in sector N improves more than the deterioration of employment in sector M. Thus the overall employment and output improves. Therefore, with labor mobility, employment and output performance can always be improved at the cost of a lower real wage.

The policy implication for the real wage is different in the case of labor immobility. Just as in the case of labor mobility, policy makers can lower the overall real wage by increasing the g value or decreasing the α value. Yet, with labor immobility, the fall in the real product wage in N and in the overall real wage would not be effective. In other words, a lower overall real wage would not improve overall employment. It means that although facing a lower real product wage, the employers could not respond to it by hiring more workers. So, with immobile labor, the workers' real wage is reduced for nothing. An important implication for policy-making is that the unemployment cannot be reduced by depressing the real wage with immobile labor. This point will be further discussed when we address employment and output next.

The Impact on Employment and Output

The simulation results for the impact on employment and output are presented in four graphs, with Figures 1 and 2 describing the case of labor immobility, and Figures 3 and 4 describing the case of

labor mobility. As illustrated in these graphs, the government has a menu of choices over employment and output.

The fall in the overall employment, i.e. the unemployment, is calculated as follows:²⁶

$$U = \hat{L}_s - (\lambda_{LM} * \hat{L}_M + \lambda_{LN} * \hat{L}_N) \quad (30)$$

The unemployment rate is the excess supply of labor expressed in the rate of change form. Since we assume that the total labor supply is fixed,²⁷ any fall in total labor demand will generate excess supply of labor or unemployment. The change in total labor demand is the weighted average of the changes in the labor demand in sectors M and N, as expressed in the parenthesis. Similarly, the change in the overall output is the weighted average of the changes in the outputs of sectors M and N, all measured in units of M.

Figures 1 and 2 present all the possible changes in the employment and output respectively, within the entire policy range ($0 < \alpha < 1$, $0 < g < 1$), assuming labor immobility. As mentioned above, in this case, firms in sector N can not respond to the price signals, i.e., they can not increase their employment and production although the price of N rises. But firms in sector M do cut back their employment and production as the real product wage in M goes up. Therefore, the employment and output in sector M would fall while the employment and output in sector N remains unchanged. Since, by assumption, $\hat{L}_N = \hat{N} = 0$ in Figures 1 and 2, the changes in M and L_M constitute the changes in the output and employment for the entire economy.

Figures 3 and 4 present all the possible changes in the employment and output respectively,

²⁶ This assumes that $U=0$ at the start of transition, as there was no (explicit) unemployment under planning system.

²⁷ It should be noted that, as unemployment arises, the labor supply may decline as older workers receive early pensions and withdraw from the labor force and female participation rates decline. This possibility is not taken into account here; nor is the decline in the labor supply due to disequilibrium in the labor and the consumer goods markets noted earlier. We use the supply of labor under no distortions as the benchmark against which the changes in labor demand are put, as mentioned before.

within the entire policy range ($0 < \alpha < 1$, $0 < g < 1$), assuming labor mobility. Now the price signals are fully effective. A higher price of N, while discouraging the employment and production in sector M, will stimulate the employment and production in sector N. Therefore, L_M , M , L_N , and N will all change accordingly.

Looking at the graphs vertically, we expectedly find great similarity between Figures 1 and 2, or between Figures 3 and 4. The employment and output are positively related and move in the same direction. In the case of labor immobility, as the employment falls in Figure 1, the output falls in Figure 2 as well. In the case of labor mobility, as the employment rises in Figure 3, the output in Figure 4 rises as well.

Looking at the graphs horizontally, we see the difference between the case of labor immobility (Figures 1 & 2) and that of labor mobility (Figures 3 & 4). In Figures 1 and 2, we observe declining employment and output curves. To be specific, as we increase the value of g from 0 to 1, while holding α constant, we move downward along a particular curve, which means that the negative change in the employment and output becomes bigger as g gets larger. Therefore, we conclude that the value of g is negatively related to the changes in the employment and output in the case of labor immobility. In Figures 2 and 4, we observe rising employment and output curves. To be specific, as we increase the value of g from 0 to 1, while holding α constant, we move upwards along a particular curve. Now the negative change in the employment and output observed at low values of g becomes smaller and eventually turn into a positive change as g gets larger. Therefore, we conclude that the value of g is positively related to the changes in employment and output in the case of labor mobility.

The policy parameter g plays opposite roles in the two cases of labor immobility and of labor mobility. A higher g deteriorates employment and output in the former case, while it improves the employment and output in the latter case. And the explanation for this lies in the difference in the firms' ability to respond to price signals in the two cases, and in the policy variable g being sector-

biased: a higher g increases the real product wage in M while decreasing the real product wage in N. In the case of labor immobility, the price signal is partially effected as only the negative part of it is operative. The higher real product wage in M indeed discourages the employment and output in sector M, while the lower real product wage in N cannot stimulate the employment and output in sector N. In the case of labor mobility, the price signal is fully effected. The negative part of the signal would decrease the employment and output in sector M, and the positive part of it would increase the employment and output in sector N.

Unlike g , The policy parameter α plays the same role in both cases of labor immobility (Figures 1 & 2) and of labor mobility (Figures 3 & 4). As we increase the value of α from 0 to 1, while holding g constant, the employment and output decline in both cases. Graphically, a bigger α shifts down the employment and output curves in all four figures. The reason α plays the same role in both cases is straight forward. A bigger α , a stronger wage indexation coefficient, leads to a higher W and, hence, to a higher real wage. As the real product wage goes up in both sectors, employment and output decline.

We now derive the policy implications with regard to employment and output. In the case of labor immobility, firstly, the employment and output are falling within all possible policy ranges. This dismal finding implies that no matter what policy combination the government chooses, employment and output will always fall if labor is immobile. The inevitability of a decrease in their employment and output brings out the depth of the problem of the socialist transitional economies at the initial stage of their transition. The real product wage in the manufacturing sector had been distorted under planning in such a way that it cannot be lowered even if the workers' wage rate is not adjusted to the rising price level at all. Unless the fall in the employment and output in this sector is offset by a significant increase in the employment and output in the non-tradable goods and services, the economy is stuck with a stagnation stemming from its rusting manufacturing sector which typically constitutes about half of her national income.

Secondly, although no policy combination could totally avoid a fall in employment and output in this case, some policy choices do alleviate this decline. There is a trade-off between the policy parameters α and g in reducing the fall in employment and output. As shown by Figures 1 and 2, either a lower g or a lower α would improve the employment and output (by moving them to a smaller negative percentage change), as the parameters g and α work in the same direction. Therefore, a higher α could be compensated for by a lower g in keeping the same rate of change in employment or output. This trade-off relationship between α and g in the case of labor immobility is presented by Figure 5. This figure shows that to keep the fall in employment (and output) at a certain percentage, the policy makers could choose among different combinations of α and g . For instance, to keep unemployment at 6%, policy makers could choose among combinations such as $(\alpha=1, g=0.2)$, $(\alpha=0.6, g=0.4)$, $(\alpha=0.4, g=0.6)$, or $(\alpha=.2, g=.8)$. Since the policy makers could choose any one of them to maintain the same unemployment rate, they should be indifferent among such a set of the "same-U" policy choices.

We now combine this trade-off relationship between α and g with the impact on the real wage in the case of labor immobility. The policy makers' indifference among each set of the "same-U" combinations of α and g then should be replaced by a preference. A combination with a higher α and a lower g should be preferred among each set, because it improves the workers' real wage at no additional cost in unemployment.

In sum, in the case of labor immobility, while there is a trade-off between α and g for a given employment and output, a combination of a higher α and a lower g is desirable because it alleviates the fall in the overall real wage while keeping the same unemployment rate and output.

The trade-off between α and g collapses as we move to the case of labor mobility in Figures 3 and 4. If labor can easily move from sector M to sector N, the positive part of the price signal would become effected as well, as discussed above. Then, a falling real product wage in sector N would induce more employment and output in this sector, and a falling overall real wage would improve the overall

employment and output. To be more specific, now as we lower the real wage by raising the value of g , employment and output would rise in sector N and, hence, economy-wide. While the role of α remains the same as in the case of labor immobility, there is no longer a trade-off between the two policy parameters. In the case of labor mobility, α and g work in opposite directions: the higher the g value and the lower the α value, the higher the employment and output. Therefore, the impact of a higher α would be reinforced, instead of being compensated for, by the impact of a lower g . In other words, now when policy makers, in consideration for the overall real wage, raise the α value, they would get an even higher unemployment rate if they simultaneously lower the g value.

The Impact On The Shortage For the Non-tradable Good

The simulation results for the impact On the excess demand for the non-tradable good are presented in Figures 6 and 7, with the former describing the case of labor immobility, and the latter describing the case of labor mobility. In both figures, as we increase g from 0 to 1 while holding α constant, we ride upwards along a particular curve meaning the excess demand for N declines. In Figure 7, the situation even turns into an excess supply of N when α is less than 1 and wages are not allowed to adjust fully to price increases. In Figure 6, as we increase α from 0 to 1, these upward sloping curves shift up by a negligible amount meaning the excess demand for N declines by a minute amount. In Figure 7, however, the curves shift down by a small amount meaning the excess demand for N increases slightly. Another difference between Figures 6 and 7 is that a given g is more effective in alleviating the existing shortage in the latter case.

The policy parameter g expectedly plays a significant positive role in alleviating the shortage for N in both cases of labor immobility and mobility, while the policy parameter α plays a negligible positive role in the case of labor immobility and a small negative role in the case of labor mobility.

The explanation for the significant positive role of g in reducing the shortage in both cases is straight forward. Since the economy inherits a shortage for the non-tradable good from the planning

era, the existing excess demand for N would be alleviated as long as the government allows the price of the non-tradable good to rise by setting g greater than 0.²⁸ As the "peg" coefficient of the price of the non-tradable good to the price of the material input, a higher g results in a higher non-tradable good price and, hence, in a lower excess demand for N.

In the case of labor immobility, a higher g reduces the excess demand for N by depressing the demand for N through the own-price effect and the national income effect. With labor immobile, the supply of N can not change. A higher non-tradable good price makes consumers substitute away from the non-tradable good. Also, a higher non-tradable good price discourages the production of M thus lowering the national income, which in turn, further decreases the demand for N.

In the case of labor mobility, a higher g reduces the excess demand for N not only by discouraging the demand for N as before, but also by encouraging the production of N. With mobile labor, the supply of the non-tradable good increases in response to the higher non-tradable good price. Thus, a given g is more effective in reducing the existing shortage for N in the case of labor mobility (Figure 7) than in the case of labor immobility (Figure 6).

The policy parameter α plays opposite roles in the two cases of labor immobility and mobility. In the case of labor immobility, a higher α discourages the production of M thus lowering the national income. This, in turn, decreases the demand for N and, hence, the shortage for N. However, as Figure 6 reveals, the alleviating impact of α on the shortage for N through the national income channel is secondary and expectably negligible.

In the case of labor mobility, α is more effective, but in the opposite direction. A higher α reduces the demand for N indirectly and by a negligible amount through the national income channel, as before. But, it now reduces the production of N directly by raising the real product wage in this

²⁸ As mentioned before, given the inherited shortage for N, we have ruled out choosing any perverse policy combinations which raises the real product wage in sector N.

sector. The latter impact expectably dominates the former one, as Figure 7 reveals. A higher α would somewhat intensify the existing shortage for N in the case of labor mobility.

We can draw the following conclusions. Firstly, the policy parameter g plays a positive and major role in alleviating the shortage in the non-tradable good market. In both the cases of labor immobility and mobility, a higher g is desirable in terms of eliminating the shortage. Secondly, variation in g only changes the degree of the alleviation, and no value of it would ever intensify the shortage. Thirdly, the policy parameter α plays a very limited role, and a negative one in the case of labor mobility, in altering the shortage for the non-tradable good.

5. CONCLUSIONS

This paper has studied the structural impact of wage-price control policies in a "controlled liberalization" of socialist transitional economies. It has used a three-factor two-sector Small Open Economy model with two policy rules of a wage indexation scheme and a regulation on the price of the non-tradable/shortage goods. It has considered the rise in the material price as well as the shortage for the non-tradables inherited from the planning era. It has analyzed the impact on the sectoral employment and output, real wages, and the shortage. It has illustrated its results quantitatively via simulation exercises also.

To highlight the implications of the wage-price control policies, we divide the transition into two stages. In the first stage, immediately after the discontinuation of central planning, labor immobility prevails due to the lack of market institutions and of well-developed (labor) markets. In the second stage, as the transition proceeds and markets develop, labor becomes perfectly mobile. With these two stages in mind, we put into perspective the policy makers' choices over their two decision parameters, namely the "peg" coefficient for the price of the shortage goods (g) and the "indexation" coefficient for the wage rate (α).

In the early stage of the transition, labor is not mobile and the economy can not fully respond to the price signals. However, the policy makers could use certain wage-price control policies to modulate the shock generated by the liberalization, such that its negative impact on employment, output and real wages would be alleviated and minimized.

To alleviate the loss in employment and output in the early stage of the transition, low values of g and α --tight controls on the price of the shortage goods and the wage rate--are desirable. The key variable here is the real product wage in the manufacturing sector. The government can reduce the fall in the employment and output in this sector by controlling the surge in its real product wage. The policy makers can do this by setting a low value for α , or g , or both. Since both a low α and a low g can curb the rise in the real product wage in sector M, there is a trade off between α and g in maintaining a given unemployment rate. The policy makers can choose among various combinations of α and g for a targeted unemployment rate.

Yet, a combination of a higher α and a lower g is preferred, from the point of view of mitigating the fall in the overall real wage. A lower g would curb the rise in the overall price level and a higher α allows more upward adjustment in the wage rate. This means a stricter control on the price of the shortage goods than on the wage rate. Since the shortage goods sector can not expand in response to a rise in the price for its products or to a fall in its real product wage because of labor immobility (signal ineffectiveness), a stricter control on the price of the non-tradables would not mean lower employment and output. Thus, the policy makers can prevent the overall real wage from falling too hard at no additional cost in employment and output.

The policy combination of a lower g and a higher α , or mainly a lower g , may seem to impose a cost on the economy by slowing down the elimination of the shortage in the non-tradable goods market. But at the early stage of the transition a higher g reduces the existing shortage in a passive way, mainly by discouraging the (unsatisfied) demand for the non-tradables. Therefore, a "lower g

policy" would not have a meaningful cost from the consideration of alleviating the shortage for the non-tradables.

In sum, the analysis suggests that at the earlier stage of the transition the policy makers set the value of g lower than that of α while holding both down. This policy combination would minimize the fall in employment, output and real wages. Meanwhile it alleviates the existing shortage in the non-tradable good market, but at a low rate.

The policy making moves to the second stage, as the labor market develops and labor becomes mobile between regions and industries. At this stage, the key variable is the real product wage in the non-tradable goods sector. Since the economy can now be more responsive to price signals, a higher non-tradable good price or a lower real product wage in this sector is desirable to induce more employment and output in this sector. The policy makers could achieve this goal by raising g or lowering α , or both. Both policies would push up the price of the non-tradables and would depress the real product wage of producing them. With adequate labor mobility, the non-tradable good sector would draw in more labor in response to its low real product wage, and would expand. At this stage, there would be a trade-off between the overall real wage and the overall employment and output. The policy makers can raise the overall employment and output, but only by lowering the overall real wage. The policy combination of a higher g and a lower α would greatly reduce the excess demand in the non-tradable goods market, since a higher g would now increase the supply of N and depress its demand simultaneously.

In sum, the analysis suggests that at the later stage of the transition the policy makers set the value of g higher than that of α while raising both towards unity. This policy combination would increase the employment and output by lowering the real wage, and would greatly reduce the shortage in the non-tradable goods market.

We can present the policy recommendations for the two stages of the transition in a simple

graph like Figure 8. We put time on the horizontal axis, assuming that labor mobility improves over time. The value of g and α are shown on the vertical axis. We start with low values for both α and g , meaning that immediately after the discontinuation of central planning the policy makers severely restrict the rise in wages and in price of the shortage goods for macro stability. As the transition proceeds, the policy makers reduce their control. In the first stage of the transition, the value of α is set higher than that of g . The value of g catches up with that of α at the turning point from labor immobility to labor mobility. As the economy enters the second stage, the value of g is set higher than that of α . Finally, the control is lifted off the price of the shortage goods and the wage rate completely. However, the speed at which g and α are raised to 1--the speed at which the wage and price controls are removed--may vary from economy to economy, depending on their structural parameters and initial conditions.

APPENDIX

A.1.

$$d_2 = \theta_{LM} \frac{\sigma_{MV}}{\theta_{KM}}; \quad d_3 = \frac{1}{1 - \theta_{BM}} (\theta_{LM} \theta_{BM} \frac{\sigma_{MV}}{\theta_{KM}} + \theta_{BM} \sigma_M);$$

$$a_1 = \frac{\theta_{LN}}{1 - \theta_{BN}} \left(\frac{\sigma_{NV}}{\theta_{KN}} + \frac{\theta_{BN}}{\theta_{LN}} \sigma_N \right); \quad a_2 = \theta_{LN} \frac{\sigma_{NV}}{\theta_{KN}}; \quad a_3 = \frac{\theta_{BN}}{1 - \theta_{BN}} \left(\theta_{LN} \frac{\sigma_{NV}}{\theta_{KN}} + \sigma_N \right);$$

where σ_j is the elasticity of substitution between value added and material input in sector j ($j=M,N$).

A.2.

$$\delta_0 = \bar{\epsilon}_N^M + \eta_M [a_1 (\Phi_N - \Phi_B \lambda_{BN}) - \Phi_B \lambda_{BN} \sigma_N]$$

$$\delta_1 = \bar{\epsilon}_N^N + \eta_N [a_1 (\Phi_N - \Phi_B \lambda_{BN}) - \Phi_B \lambda_{BN} \sigma_N]$$

$$\delta_2 = -d_2 (\Phi_M - \Phi_B \lambda_{BM}) - a_2 (\Phi_N - \Phi_B \lambda_{BN})$$

$$\delta_3 = -d_3 (\Phi_M - \Phi_B \lambda_{BM}) - a_3 (\Phi_N - \Phi_B \lambda_{BN}) - (\Phi_B^M + \Phi_B \lambda_{BM} \sigma_M + \lambda_{BN} \sigma_N)$$

$$b_1 = \frac{1}{\Delta} \lambda_{LN} \frac{\sigma_{MV}}{\theta_{KM}}; \quad b_2 = \frac{1}{\Delta} (\lambda_{LM} \theta_{BM} \frac{\sigma_{MV}}{\theta_{KM}} + \lambda_{LN} \theta_{BM} \frac{\sigma_{NV}}{\theta_{KN}});$$

$$\Delta = \lambda_{LM} \frac{\sigma_{MV}}{\theta_{KM}} (1 - \theta_{BM}) + \lambda_{LN} \frac{\sigma_{NV}}{\theta_{KN}} (1 - \theta_{BN})$$

where Φ_j is the share of final commodity j in national income ($j=M,N$), Φ_B is the ratio of total material usage over national income, Φ_{BM} is the ratio of the net import (export) of B over national income, η_j is the income elasticity of demand for final good j ($j=M,N$), and $\bar{\epsilon}_N^j$ is 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.)

Table 1. The Structural Parameter Values Used in Simulations²⁹

Production side:

Sectoral shares in factor endowment: Production technology:

$\lambda_{LM} = .36$	$\sigma_{MV} = .2$ (L and K in V of M)
$\lambda_{LN} = .45$	$\sigma_M = .1$ (V and B in M)
$\lambda_{LB} = .19$	$\sigma_{NV} = .2$ (L and K in V of N)
$\lambda_{KM} = .39$	$\sigma_N = .1$ (V and B in N)
$\lambda_{KN} = .61$	
$\lambda_{BM} = .60$	
$\lambda_{BN} = .40$	

Factor shares in unit costs:

$\theta_{LM} = .66$
$\theta_{KM} = .13$
$\theta_{BM} = .21$
$\theta_{LN} = .71$
$\theta_{KN} = .14$
$\theta_{BN} = .15$

Demand side:

Sectoral shares in GDP:

$\Phi_M = .56$	$\Phi_B^M = .05$
$\Phi_N = .49$	
$\Phi_B = .19$	

Price and income elasticities:

$e_N^N = -0.7$	$e_N^M = .13$
$\eta_N = 1.2$	$\eta_M = .9$

²⁹ The estimation of parameter values is mainly based on United Nation (1990), Marer et.al (1992), Corbo et.al (1991), CIA (1989 & 1990). For most of them, a five-country average is calculated as the representative value. The price elasticities, income elasticities and the elasticities of substitution between factors are taken from the works of Kushnirsky (1993), Koropecjy (1981), Berndt & Wood (1975), and Walker (1989). For details, see Fardmanesh and Tan (1995).

Case of Labor Immobility

Figure 1

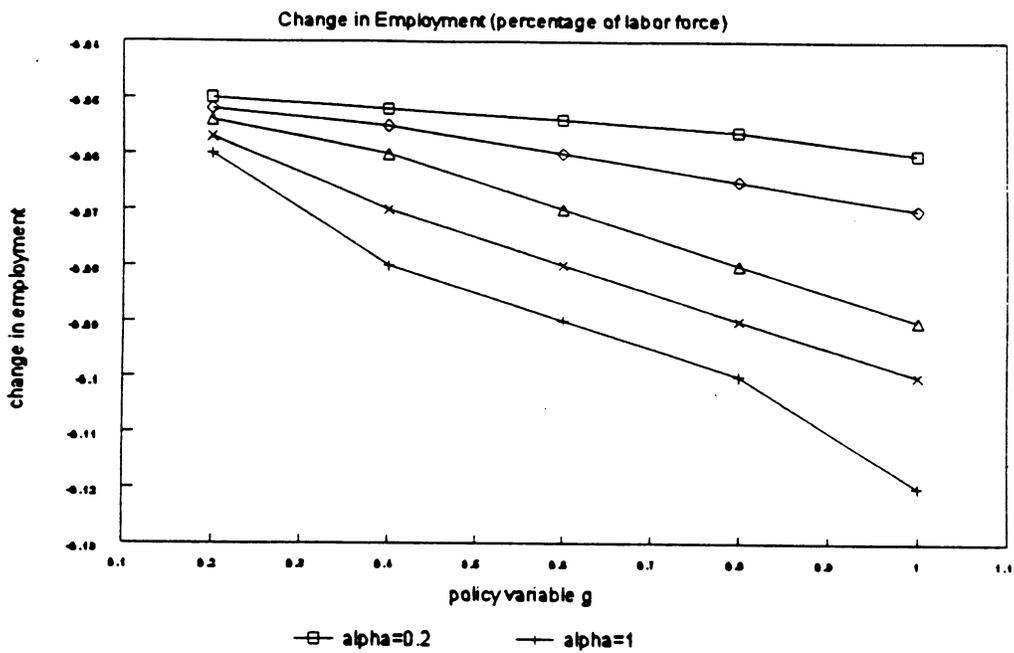
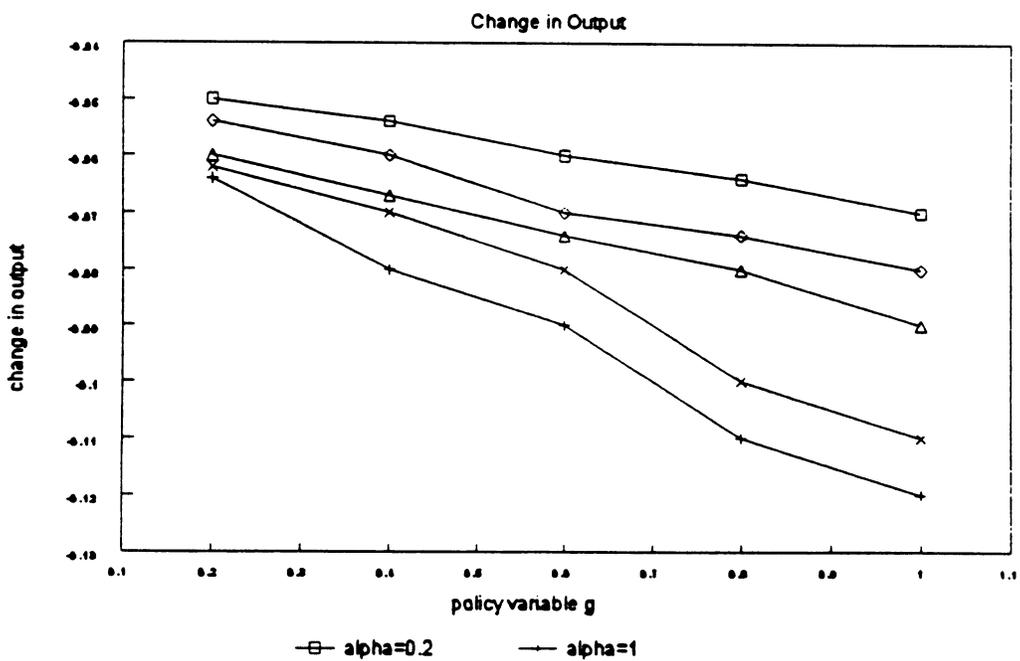


Figure 2



Case of Labor Mobility

Figure 3

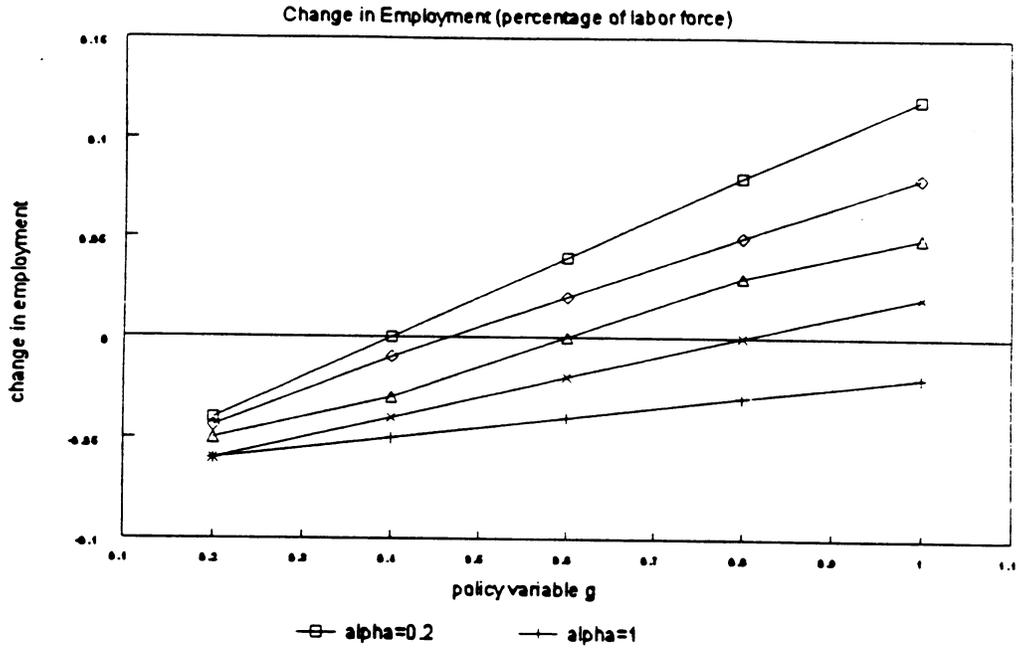


Figure 4

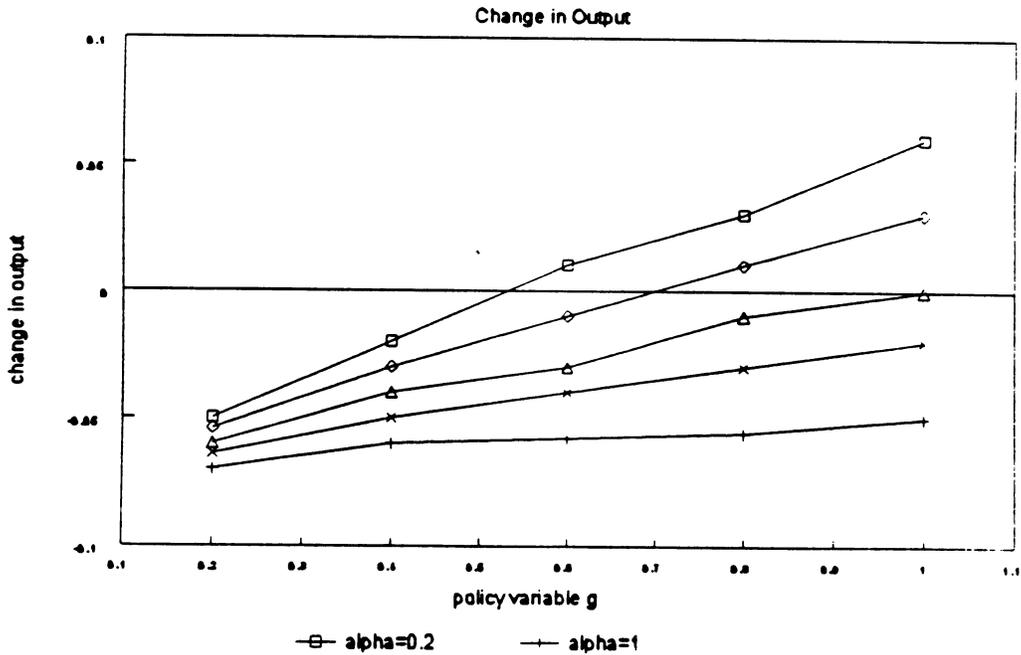


Figure 5

Policy Trade-off in the Case of Labor Immobility

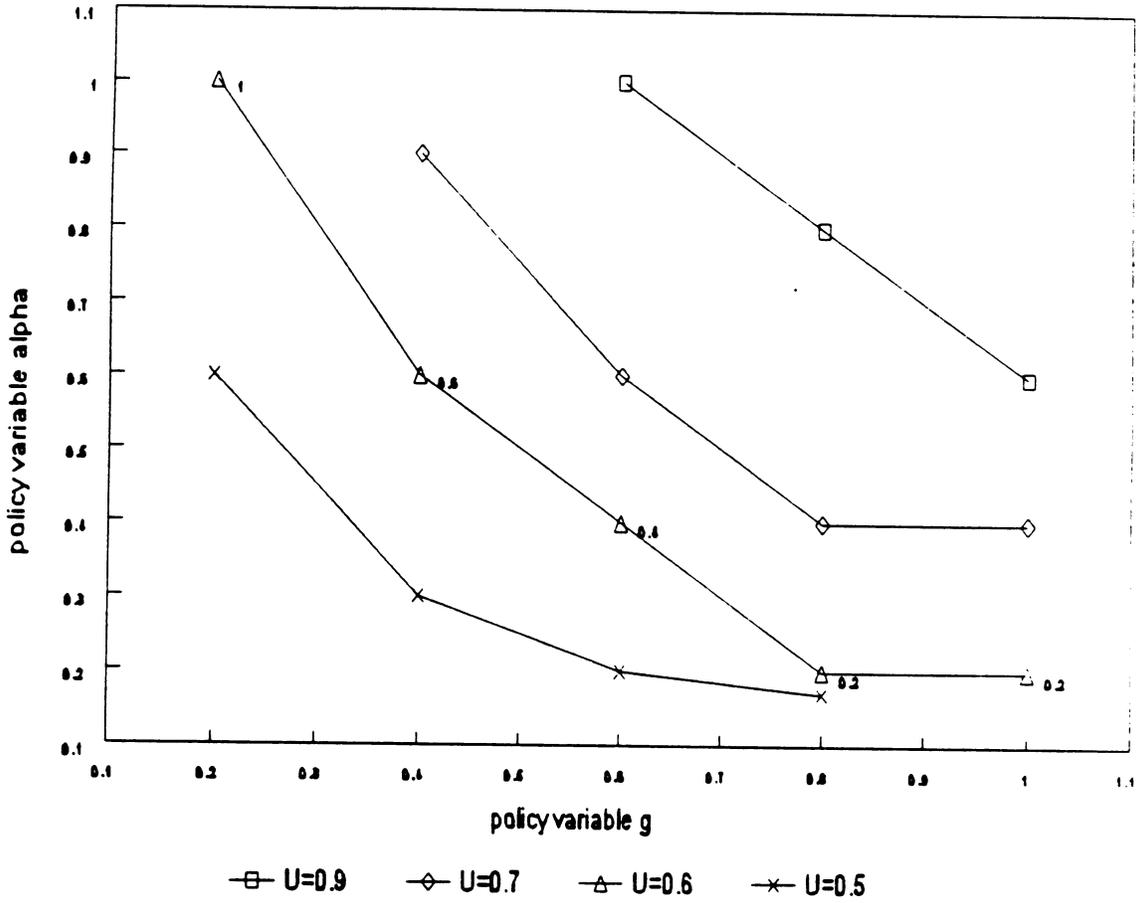


Figure 6

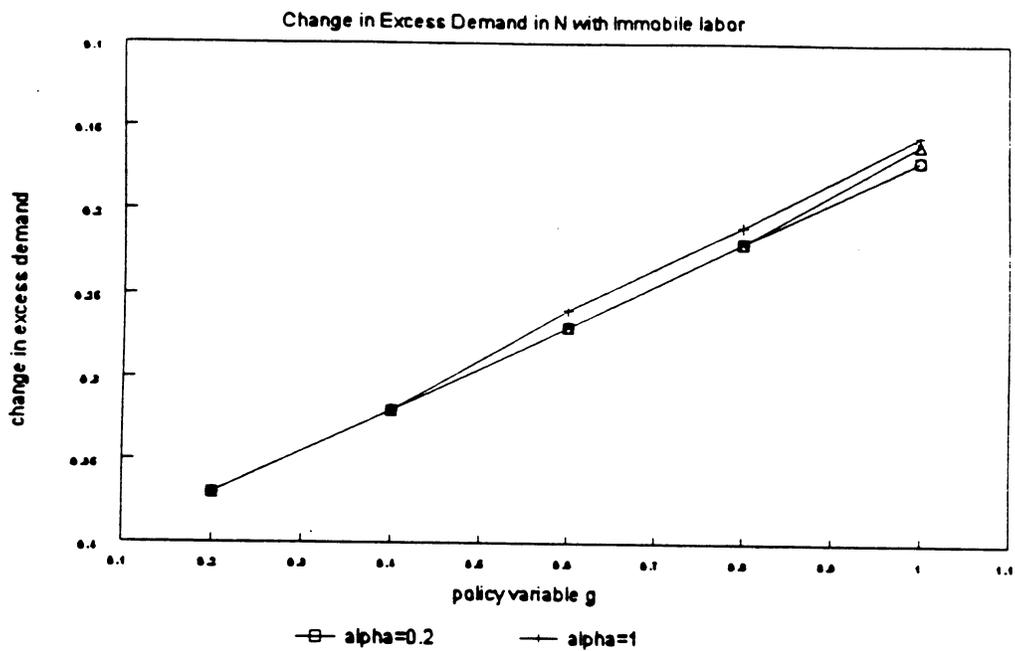


Figure 7

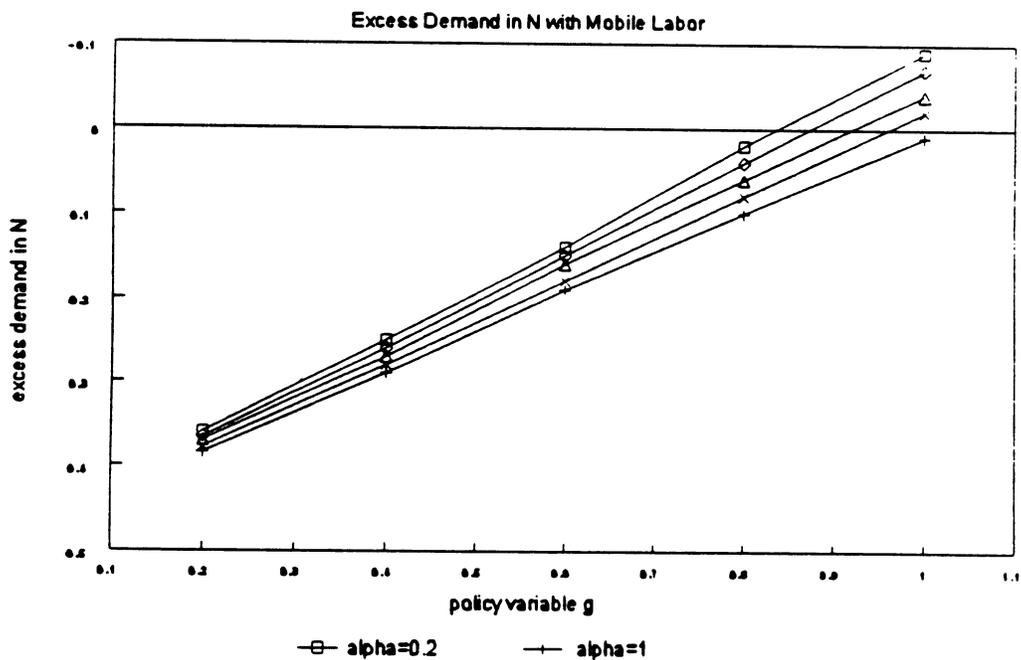
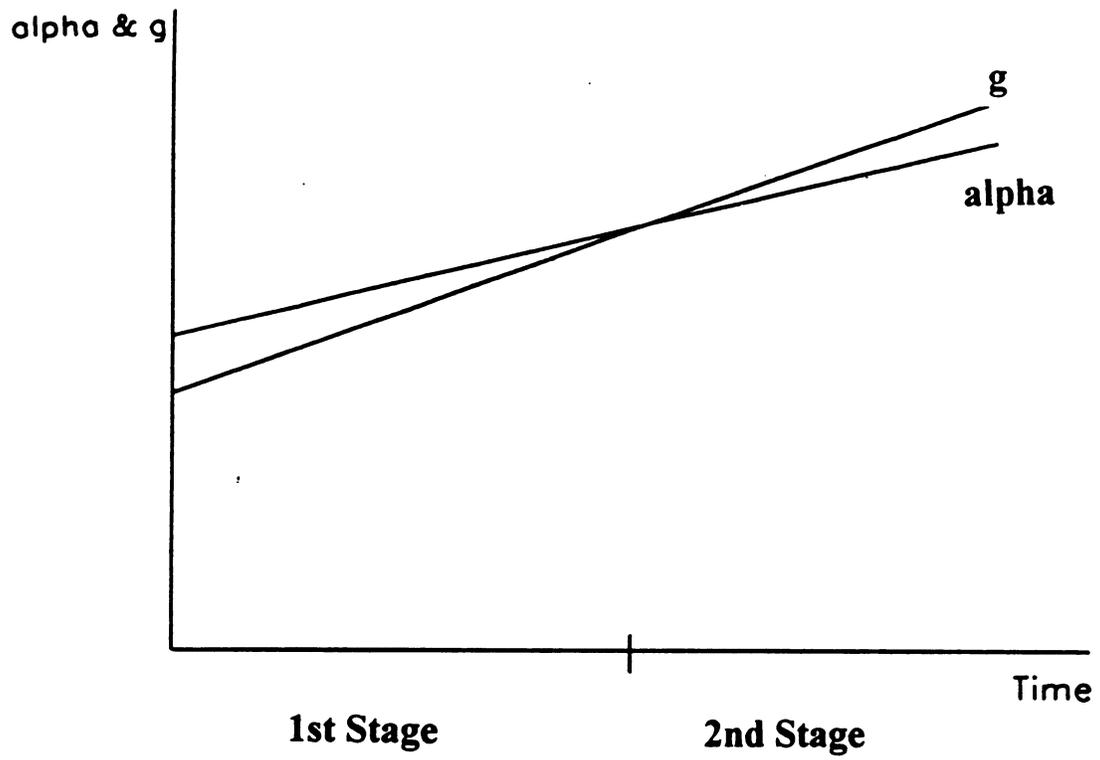


Figure 8



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