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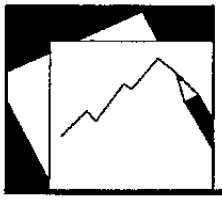

IMF Working Paper

Obstacles to Faster Growth in Transition Economies: The Mongolian Case

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Obstacles to Faster Growth in Transition Economies: The Mongolian Case

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Abstract

The obstacles to economic growth in Mongolia are modeled with a supply-side growth model calibrated to represent inefficient use of resources and intermediation. Progressive removal of inefficiencies over time by means of privatization of banks and industrial enterprises potentially leads to increased productivity and increased capital accumulation, raising economic growth and per capita output.

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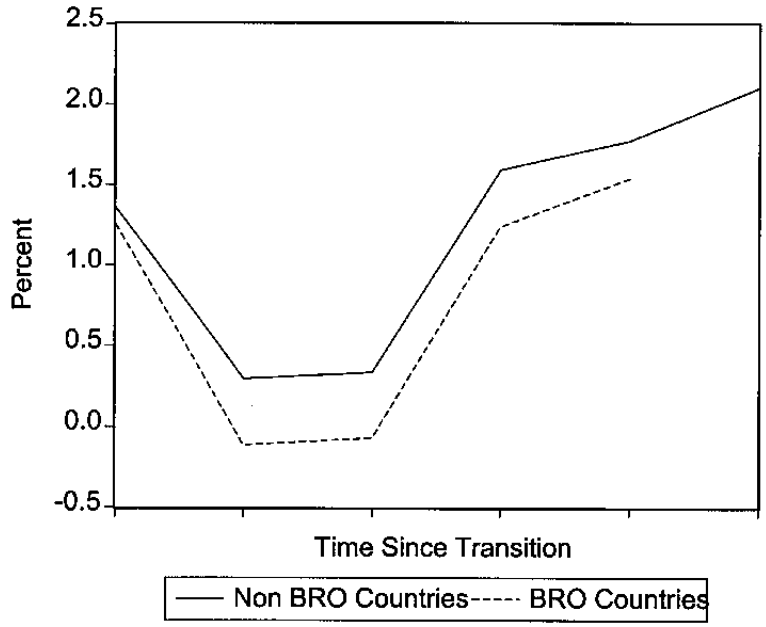
I. INTRODUCTION

Transition Economies (TE's) suffer from a variety of obstacles to economic growth, ranging from inadequate financial intermediation and excessive reliance on cash transactions to inefficient state enterprises; inadequate or antiquated infrastructure; workers who are poorly trained, equipped, and motivated; inadequate distribution systems; lack of access to modern technology and methods of production and distribution; and lack of information about market conditions at home and abroad. Frequently, government policies may impose an inappropriate set of incentives on the firms. For example, if state-owned banks are not required to maximize profits and are not adequately supervised, they may use their freedom from supervision to engage in unwise or even unethical lending. Similarly, state-owned firms may in the absence of hard budget constraints operate inefficiently in a variety of ways. Panel data evidence (Berg, Borensztein, Sahay, and Zettlemeyer, 1999) has shown that structural constraints and initial conditions explain a large part of the variation in output growth among TE's. In order to model the effects of such constraints and their potential removal, a supply-side approach seems most relevant. Asian TE's such as Mongolia have also faced a negative demand shock from the Asian Financial Crisis including the collapse of currencies such as the Korean won and the recession in Japan.

This paper approaches these issues through a supply-side growth model by calibrating a Western-style production function to the Mongolian economy in the base year 1994, assuming that actual output in the nonagricultural sector is produced by the actual labor force and an implied capital stock, both of which are used inefficiently relative to Western standards. In other words, capital and labor are assumed to be just as substitutable in the Mongolian nonagricultural sector as in Western Europe. But the available factors of production are assumed to be used inefficiently, i.e. output takes place inside the production frontier. Capital is assumed to be used in State Owned Enterprises (SOE's) 40 percent as effectively as in Western Europe, while labor is used 35 percent as effectively, partly because the capital/labor ratio in Mongolia is only 16 percent of the Western level. In addition, Mongolian investment is less effective than Western investment in adding to the capital stock because of the inefficiency of the financial system, which generates a high level of bad loans as well as providing inefficient payments services.

Removing these inefficiencies by privatization and reform, even partially, can be expected to raise total factor productivity and thus the growth of output, even without additional domestic and foreign savings. For example, Berg, Borensztein, Sahay, and Zettlemeyer (1999) have estimated that increased structural reform (of 0.1 in selected indices as seen in Chart 2 below) has been associated with significant additional growth as shown in Chart 1 below. (Note BRO refers to the Baltics, Russia, and Other former members of the Soviet Union.)

Chart 1. Estimated Growth Effect of Structural Reform in Transition Economies



Source: Berg, Borensztein, Sahay, and Zettelmeyer (1999), Table 4.

Of course, additional growth will generate additional savings and investment even without changes in savings behavior. And an improved domestic financial sector with privatized and more efficient industry could be expected to raise both domestic and foreign savings as well.

To summarize the results, the Baseline projection beginning in 1998, assuming no improvement in the efficiency of capital, labor, or financial intermediation and no increase in either the domestic savings rate or the inflow of foreign capital, shows that Mongolian GDP growth would be expected to stagnate at around 2.5 percent a year over the ten years from 1998-2008. On the other hand, if financial reform were to improve the efficiency of the banking system in providing payments services and screening loans more effectively so that investment would become more efficient, growth could be expected to improve to almost 3 percent a year over the same period. Privatization of the industrial sector could be expected to add further growth, by improving the efficiency of use of both physical and human capital. Higher output would add further to the growth of investment. Combined, these factors would raise growth to 4.4 percent a year, even without increased saving. If we add the possibilities of gradually raising the domestic Mongolian saving rate from 15 percent to 18 percent, growth could increase to 4.6 percent a year. This is under the assumption that foreign capital continues to be provided to Mongolia at the current relatively low level. But if the Mongolian economy improves as much as previously assumed, additional foreign capital is almost certain to arrive. A gradual increase in the foreign savings rate could raise the Mongolian growth rate to 4.8 percent. Failure to adopt these reforms would leave the growth rate at around 2.5 percent a year.

II. The Mongolian Economy in Transition

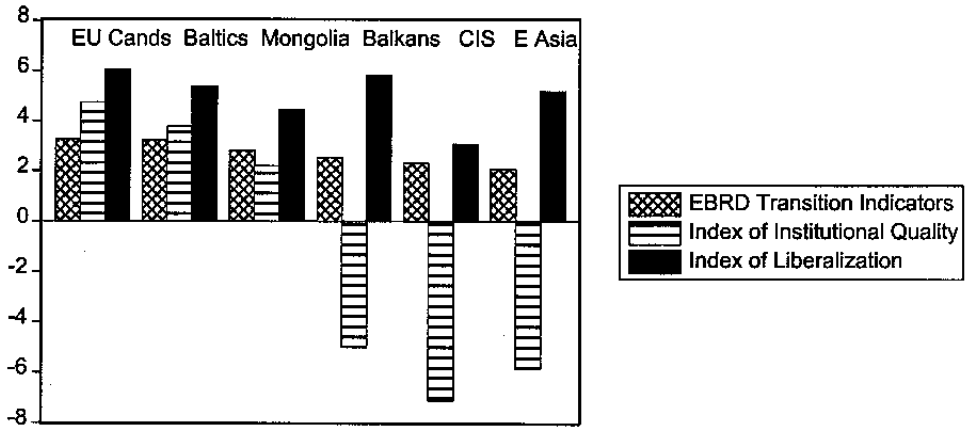
Mongolia is a large, land-locked, lightly populated eastern Asian economy sandwiched between Russia and China. Almost half the population is engaged in agriculture, particularly the uniquely Mongolian herding industry. The urban population is primarily located in the capital, Ulaan Baator, and a few other large towns. Transportation and communications services and infrastructure are limited. The major industries outside of agriculture are cashmere processing, copper and gold mining, food processing, and construction materials.

The Mongolian transition to a market economy began in 1991, under the leadership of the Mongolian Peoples' Revolutionary Party (MPRP) which had governed Mongolia under communism. Privatization began with the retail sector and with the herding industry, which is the original basis for the Mongolian economy. But many larger industries that had been subsidized by the former Soviet Union quickly went bankrupt without subsidies or new investment. Several bank failures occurred in 1996, including the largest bank which had just completed a large new building in the capital. In the process of recapitalizing the banking sector, the government created "Reconstruction" bonds to replace the bad loan portfolios of the state-owned banks. These bonds pay interest at the discretion of the government and hence are illiquid or "dead" assets on the banks' balance sheets. They effectively inhibit the privatization of the state-owned banks.

By contrast with many other transition economies, especially those from the former Soviet Union, Mongolia has suffered a smaller fall in national output, with 1999 at 93 percent of 1989 according to the October 2000 *World Economic Outlook*. By comparison, the countries of the former Soviet Union (excluding the Baltics) suffered a 50 percent decline in output over the same period. At the same time, it is judged to have achieved a relatively high level of institutional quality, rating close to Latvia and Lithuania in a comprehensive analysis of governmental effectiveness and related areas. According to the EBRD transition indicators and other indexes shown in Chart 2, Mongolia has proceeded farther than most members of the Commonwealth of Independent States (CIS), the association of former members of the Soviet Union, and is comparable in its progress to Romania and Bulgaria, which are on the list of potential members of the European Union. As shown in Table 1 below, recent output growth in Mongolia, averaging 3.3 percent, has been considerably better than the average of CIS countries.

In 1996, a coalition of non-communist parties won the Parliamentary election and began to speed up the reform process. In 1998–99, a new series of bank failures erupted among the state-owned banks. When the coalition government sought to sell one of the failed banks to a private bank, the opposition obstructed the process and eventually the government was forced to resign. A candidate to succeed as Prime Minister was assassinated in the summer of 1998. In 2000, the MPRP was returned to power following national parliamentary elections.

Chart 2. Measures of Transition



Source: IMF World Economic Outlook, October 2000

EU Candidates (Bulgaria, Czech Rep., Hungary, Poland, Romania,Slovak Rep., Slovenia)
Baltics (Estonia, Latvia, Lithuania)
Balkans (Albania, Bosnia-Herzegovina, Croatia, Macedonia FYR)
CIS (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Rep., Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan)
E Asia (Cambodia, China, Lao P.D.R., Vietnam)

Major industries such as banking, cashmere processing, and copper mining have yet to be privatized. The financial sector remains highly undeveloped, with only a few private banks offering modern payments services combined with sound lending practices. Thus, the population relies on cash for a large proportion of its transactions, with cash accounting for 80 percent of the supply of narrow money. See Table 1 for recent data on the economy.

Table 1. Selected Economic Data

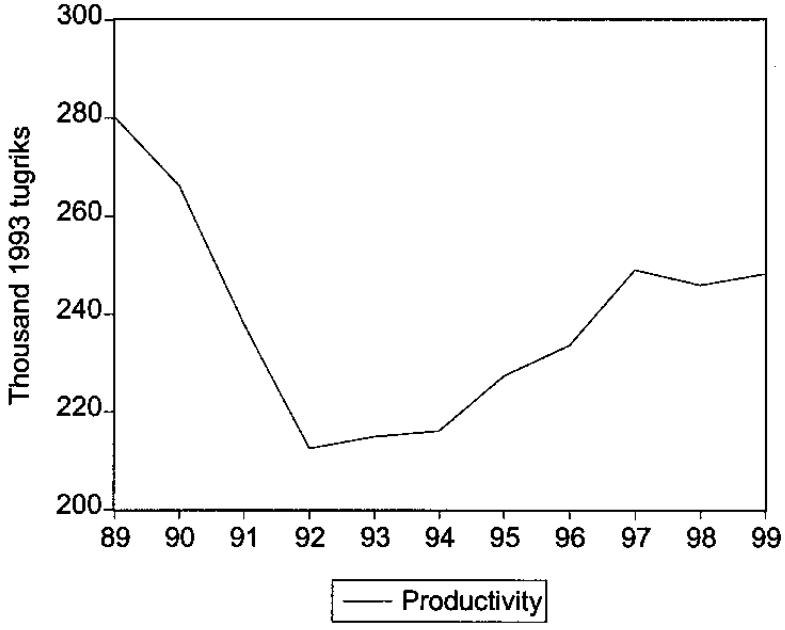
Year	1996	1997	1998	1999
GDP growth, in percent	2.4	4	3.5	3.2
Industrial output, billion tugriks (1993 prices)	91.5	95.5	98.6	99.8
Annual inflation rate, in percent[1]	44.6	20.5	6	10
Unemployment, thousand[1]	55.4	63.7	49.8	39.8
Exports, in millions of US dollars	423.4	569.5	462.3	454.2
Imports, in millions of US dollars	510.8	538.3	582.4	567.1
Government revenue, billion tugriks (current prices)	162.9	222.5	240	266.3
Government expenditure, billion tugriks (current prices)	211.3	287.6	342.1	364.7
Currency in circulation, billion tugriks[1]	46.1	56.8	61.8	91.6
Narrow money (M1), billion tugriks[1]	64.3	76.1	82.6	114.8
Broad money (M2), billion tugriks[1]	128.4	170.1	167.2	220.2
Official exchange rate, tugriks per US dollar[2]	693.5	813.2	902	1,072.4

Source: Bank of Mongolia and IMF.
[1]End of period.
[2]Period average.

Chart 3 shows the behavior of output and employment since the beginning of transition. Chart 4 reveals that productivity, which initially fell sharply with the collapse of output in formerly subsidized industries, has begun to recover but remains stagnant.

Chart 3. Output and Employment in Mongolia

Chart 4. Output per Worker



III. SUPPLY-SIDE MACRO MODEL FOR MONGOLIA

Based on previous work by the author on Central and Eastern European Transition Economies [Black, 1997], a production function with a constant elasticity of substitution of 0.5 between capital and labor has been specified for the nonagricultural sector of the Mongolian economy, based on conditions in the base year 1994. Such a production function has been estimated for Western Europe by numerous authors [Artus 1984, Helliwell, et al 1986, Torres and Martin 1990] and calibrated for Transition Economies in Central and Eastern Europe (CEE) by both Boote (1992) and Black (1997). The working assumption is that TE's are producing below the technological frontier because they utilize both capital and labor inefficiently. While there are available measures of the existing capital stock, these are cumulated values at accounting prices from the socialist era and can hardly be said to reflect an equivalent to capital in the Western sense. The solution to this problem adopted here is to infer the stock of capital indirectly, by inverting a known production function, assuming a given degree of inefficiency. For Mongolia, the assumption that Western technological standards will gradually be adopted seems appropriate for the nonagricultural sector, but is not assumed for the important agricultural sector, which is left exogenous.

Output and the capital stock for both Mongolia and Western Europe are measured in 1993 dollars of international purchasing power, which requires converting Mongolian GDP from local currency (tugriks) at the PPP exchange rate calculated by the Penn World Tables International Comparisons Project. Initially, the parameters of the production function are calibrated with $g = h = f = 1$ for Western Europe in 1993 international dollars as of 1994 with $\sigma = 0.5$. This gives

$$V = [P_L/L + P_K/K]^{-1}$$

with $P_L = .019$ and $P_K = .475$. In addition an exponential time trend is introduced representing capital accumulation and technological progress from the base year at the rate of 2.5 percent per year.

For Mongolia the (unknown) amount of initial capital K_0 in the base year can be estimated as shown in the Appendix by calibrating (in)efficiency parameters g and $h(1+f)$ in the production function and inverting

$$V_0 = F[gK_0, h(1+f)L_0]$$

to find K_0, given V_0, L_0, g, h and f[2]. For Mongolia, $g = .4$ and $h(1+f) = .35$ were calibrated to ensure that the shares of labor $S_L = P_L V/h(1+f)L$ and capital $S_K = P_K V/gK$ match those recorded in the data for the base year. More explicitly, $h(1+f) = P_L V/S_L L$ and $gK = P_K V/S_K$. Thus the *effective* labor used is $h(1+f)L$ and *effective* capital used is gK_0.

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[2] $f = .5[(K_m/L_m)/(K_e/L_e)-1]$ where K_e/L_e is the capital labor ratio in Europe and K_m/L_m is the capital labor ratio in Mongolia. Thus human capital is less efficient in proportion to the lack of capital per worker, as compared to the European level.

After calibration in 1993 international dollars, the base year measurements of output and capital are converted back into 1993 tugriks[3]. The share of labor in the nonagricultural sector of the Mongolian economy was estimated at 42 percent in 1996, in line with data from the Mongolian Statistical Office. The resulting production structure implies that the 1996 Mongolian real wage [given by the marginal product of labor] evaluated in purchasing power adjusted terms was 10 percent of the European level and capital per worker was 16 percent of the Western level.

Beginning in the base year, capital is added by new investment, which is financed with domestic or foreign saving, less depreciation and the share of investment going to agriculture. The labor force has been projected based on demographic analysis. Starting with the initial values of V, K, and the path of L_t, the growth of capital is based on

$$\Delta K_t = e(s_p + s_g + s_f)Y_{t-1} - \delta K_{t-1}$$

where s_p, s_g, s_f, are the shares of private saving, government saving, and foreign saving in GDP and e is the efficiency ratio for intermediation of savings into investment. The lag structure of one year implies that it takes either time to build or time to invest. Output is then projected from the production function on the basis of the given capital stock and labor force.

From the production function and the savings equation [using lower case for logs], we can represent the simulations as follows:

$$dy_0 = A_{na}[S_K dk + S_L dl] + A_a dy_a$$
$$dk = e(s_p + s_g + s_f)Y/K - \delta = esY/K - \delta = (e + de)(s + ds_p + ds_f)Y/K - \delta$$
$$dy = A_{na}[S_K(dg + dk) + S_L(dh + dl)] + A_a dy_a$$
$$\hat{dy} = dy - dy_0 = A_{na}[S_K[dg + (sde + eds_p + eds_f)Y/K] + S_L dh]$$

The first equation represents the baseline simulation in which g and h are not changed, allowing separately for growth in the nonagricultural and agricultural sectors, where A_{na} and A_a are the shares of output in the respective sectors. The second equation shows the effect of savings on capital growth, including changes in the efficiency of intermediation de and in the private and foreign savings rates ds_p and ds_f. The third equation shows the growth rate including changes in g and h. Subtracting the first from the third and taking account of the second gives the fourth, which decomposes the growth effect of the policy changes into its components. The simulations which follow include the baseline simulation dy_0, and changes in growth due to policy reforms which affect the efficiency of intermediation de, combined successively with improvements in

[3] Thus $P_L = .0005039$ after conversion to tugriks, while P_K is unaffected, since the denomination of both V and K change proportionately.

capital productivity *dg*, human capital productivity *dh*, private savings ds_p and foreign savings ds_f.

The Baseline Projection is shown in Table 2. Starting in 1998, domestic saving is assumed to remain constant at the 1997 level of 15 percent of GDP. The overall government budget is assumed to run a surplus of 2 percent of GDP. The current account deficit is assumed to shrink gradually from the 1997 level of 5.7 percent of GDP by 0.2 percent of GDP per year, which keeps the implied capital inflow approximately constant at $50 million per year. Only 80 percent of investment is assumed to be added net to the capital stock because of the inefficiency of the financial system. Bad loans are also subtracted out of net investment. The labor force grows 2.6 percent a year in accordance with demographic projections. The efficiency parameters are unchanged over time. In the resulting projection, the economy grows through accumulation of capital and labor at about 2.5 percent per year. The real wage and capital per worker increase just about as fast as in Western Europe, which is also assumed to be growing at 2.5 percent a year. The share of labor gradually rises and the return on capital falls as the capital/labor ratio rises over time.

Table 2. Baseline Projection

Year	1998	2003	2008
Employment (in millions)	0.87	1.01	1.15
Nonagricultural employment (in millions)	0.41	0.43	0.45
Domestic private saving[1]	15.21	15.21	15.21
Foreign saving[1]	5.7	4.7	3.7
Government saving[1]	0.5	2	2
Investment[1]	21.41	21.91	20.91
Net investment[2]	5.72	7.70	7.17
Nonagricultural output[2]	125.05	137.26	148.91
Agricultural output[2]	72.97	86.66	102.93
GDP[2]	196.43	223.92	251.83
Growth rate (since 1998, in percent)		2.65	2.52
Output per worker (nonagricultural)[3]	304.96	318.48	328.74
Capital, nonagricultural[2]	264.82	302.57	339.92
Effective capital[2]	105.93	121.03	135.97
Capital per worker[3]	645.82	702.06	750.44
Relative capital per worker[4]	0.16	0.16	0.15
Share of labor	0.44	0.46	0.48
Real wage[3]	133.99	146.95	157.76
Relative wage[4]	0.10	0.09	0.09
Return on capital	0.26	0.24	0.23

[1]Percent of GDP.
[2]Billion 1993 Tugriks.
[3]Thousand 1993 Tugriks.
[4]Relative to European level.

IV. Effects of Policy Reforms

A. Financial Sector Reform

The first policy reform simulation considers an increase in the efficiency of the financial sector through privatization of the remaining state-owned banks and reform of the payments system and lending practices. A key element is reliquifying the banking system by converting the government's bank restructuring bonds which are held as assets by the banks into fully collateralized marketable bonds. By replacing "dead" assets in the banks' balance sheets, this reform would enable the banks to be sold. Replacing the management of the state banks is essential to developing a culture of commercial banking, with an emphasis on repayable loans to viable borrowers on the asset side and provision of efficient payments services on the liability side. More effective supervision of the banking sector by the central bank would be an essential element. In this reform the percentage of investment that actually adds to the capital stock is raised from 80 percent to 96 percent over a ten–year period. Actually, following King and Levine (1993) one would also expect this reform to add to total factor productivity by raising g and h as well, but this effect is left for the next two simulations. According to Table 3, by 2003 this would raise net investment by 56 percent relative to the Baseline Projection, raising capital by almost 3 percent and output in the nonagricultural sector by 1.7 percent. By 2008 net investment would rise by 88 percent and the capital stock by 11 percent. This would raise nonagricultural output 6.2 percent and GDP by 3.7 percent. The real wage would increase 11 percent faster than in the Baseline Projection, and so rise faster than in Europe. By themselves, these reforms are estimated to raise growth over the decade by about 0.4 percent a year to 2.9 percent. The growth effects are shown in Charts 5 and 6.

Table 3. Financial Reform[1]
(e rises over time)

Year	2003	2008
Net investment	56.15	87.83
Nonagricultural output	1.72	6.21
GDP	1.06	3.67
Growth rate (since 1998, percent per year)	2.86	2.89
Output per worker (nonagricultural)	1.72	6.21
Capital, nonagricultural	2.89	11.04
Effective capital	2.89	11.04
Capital per worker	2.89	11.04
Relative capital per worker[2]	0.00	0.02
Share of capital	-0.01	-0.02
Share of labor	0.01	0.02
Real wage	3.07	11.22
Relative wage[2]	0.00	0.01
Return on capital	-0.01	-0.02

[1]Percent change from Baseline Projection, except Growth Rate.
[2]Relative to European level.

B. Privatization

In the second policy reform simulation, privatization of commercial and industrial firms is assumed to gradually raise the efficiency of utilization of capital from 40 percent to 50 percent of the West European level over ten years. This is a modest rate of increase. Not only would existing capital be used more effectively, but new management could be expected to invest more in new technologies and new marketing and distribution capabilities. This can be argued to be a credible rate of improvement, given the low initial level of efficiency, which also includes obsolete infrastructure. In combination with the effect of privatization of the state-owned banks and reform of the payments mechanism and lending practices, net investment now rises by 76 percent by 2003 and by 126 percent by 2008, according to Table 4. The capital stock rises by 17 percent in five years and by 44 percent in ten years. Nonagricultural output rises by 9 percent by 2003 and by 20 percent by 2008. GDP growth is increased by over 1 percent per year (see Charts 5 and 6) and the real wage now rises 4 percent faster than the European standard or 41.5 percent faster than in the Baseline Projection. The share of labor also increases over time as capital per worker rises by 15 percent by 2008, while the rate of return on capital falls.

Table 4. Privatization and Financial Reform[1]
(*e* and *g* rise over time)

Year	2003	2008
Net investment	75.97	125.71
Nonagricultural output	8.73	20.12
GDP	5.35	11.89
Growth rate (since 1998, in percent, per year)	3.73	3.67
Output per worker (nonagricultural)	8.73	20.12
Capital, nonagricultural	3.91	15.00
Effective capital	16.90	43.75
Capital per worker	3.91	15.00
Relative capital per workerr[2]	0.01	0.02
Share of capital	-0.04	-0.09
Share of labor	0.04	0.09
Real wage	17.60	41.52
Relative wage[2]	0.02	0.04
Return on capital	-0.01	-0.03

[1]Percent change from Baseline Projection, except Growth Rate.
[2]Relative to European level.

C. Human Capital

An important aspect of the effect of privatization not included in the above scenario is improved efficiency of use of labor. Private sector management should result in more efficient employment patterns and increased training of workers to utilize better technologies. These factors are assumed to increase the efficiency of labor only about 60 percent as much as the increase in the efficiency of use of capital assumed above. Thus labor efficiency is assumed to rise from 35 percent of the European level to 41 percent, again a modest rate of increase. Table 5 shows that investment now rises by 90 percent over five years and almost 200 percent in ten years. As a

result, the capital stock rises by 5 percent by 2003 and 18 percent by 2008. Effective capital per worker rises by 18 percent in five years and 48 percent in ten years. The increase in human capital combined with other factors raises growth by 1.8 percent per year to 4.35 percent (Charts 5 and 6). The real wage increases 48 percent from the base and rises from 10 to 13 percent of the European level by 2008. The increased efficiency of labor now offsets the effects of the higher capital/labor ratio and keeps the rate of return on capital from falling more than in the Baseline Projection.

Table 5. Human Capital Efficiency[1]
(*e*, *g*, and *h* rise over time)

Year	2003	2008
Net investment	89.64	195.57
Nonagricultural output	13.47	32.74
GDP	8.26	19.36
Growth rate (since 1998, in percent, per year)	4.29	4.35
Output per worker (nonagricultural)	13.47	32.74
Capital, nonagricultural	4.53	18.35
Effective capital	17.60	47.93
Capital per worker	4.53	18.35
Relative capital per worker[2]	0.01	0.03
Share of capital	-0.02	-0.05
Share of labor	0.02	0.05
Real wage	18.12	47.52
Relative wage[2]	0.02	0.04
Return on capital	0.01	0.00

[1]Percent change from Baseline Projection, except Growth Rate.
[2]Relative to European level.

D. Domestic Saving

If the economy is growing steadily and if the reformed and privatized financial sector offers greater safety and increased payments services to the Mongolian people, one could expect a gradual increase in the private saving rate, through increased enterprise profits as well as increased per capita income. A gradual increase in the private saving rate from 15 percent to 18 percent of GDP would add another boost to growth through faster growth of the capital stock, shown in Table 6. Investment would now rise by almost 300 percent by 2008, raising the capital stock by 26 percent, the effective capital stock by 57 percent, and output by 37 percent. This could raise the growth rate to 4.6 percent and lead to a 56 percent increase in the real wage by 2008.

Table 6. Domestic Saving[1]
(e, g, h, and s_p rise over time)

Year	2003	2008
Domestic private saving[2]	1.38	2.75
Investment[2]	1.38	2.75
Net investment	124.69	293.92
Nonagricultural output	14.50	37.39
GDP	8.89	22.11
Growth rate (since 1998, in percent, per year)	4.41	4.58
Output per worker (nonagricultural)	14.50	37.39
Capital, nonagricultural	6.15	26.07
Effective capital	19.41	57.59
Capital per worker	6.15	26.07
Relative capital per worker[3]	0.01	0.04
Share of capital	-0.02	-0.07
Share of labor	0.02	0.07
Real wage	20.00	56.48
Relative wage[3]	0.02	0.05
Return on capital	0.01	-0.01

[1]Percent change from Baseline Projection, except Growth Rate.
[2]Percent of GDP vs. Baseline Projection.
[3]Relative to European level.

E. Foreign Saving

Successful reform and growth in Mongolia can be expected to bring increased interest and willingness of foreign investors to participate in the Mongolian economy, bringing both foreign capital and technological expertise. Instead of a decline in the current account deficit from 5.7 percent of GDP to 3.7 percent, the projection in Table 7 assumes a rise from 5.7 percent to 6.2 percent of GDP. This corresponds to an increase in capital inflows from about $50 million a year to about $90 million and would in combination with the other factors raise net investment by as much as 386 percent relative to the Base Projection by 2008. In this case, the capital stock would rise by 33 percent, the effective capital stock by 67 percent, and nonagricultural output by 42 percent. Combined with the other factors this could be expected to raise growth to 4.8 percent per year over the ten year period to 2008.

F. Sensitivity Analysis

In a sense, the preceding simulation analyses demonstrate the sensitivity of the projections to changes in the parameters of the underlying model. However the model was based on a couple of key assumptions, in particular the values of g and K_0, the inefficiency of capital use and the initial level of the capital stock. It will be recalled that the inefficiency parameters were set so as to insure that the shares of capital and labor match those in the data in the base year. This ties down the labor parameters, but still leaves some flexibility for g and K_0. As an exercise, if we set $g = 0.45$ instead of 0.40, the initial capital stock in 1998 falls from 264.82 billion tugriks to 221.52. Notice that the level of effective capital services gK_0 only changes from 105.93 to 99.68.

Table 7. Foreign Saving[1]
(e, g, h, s_p and s_f rise over time)

Year	2003	2008
Domestic private saving[2]	1.38	2.75
Foreign saving[2]	1.25	2.50
Investment[2]	2.63	5.25
Net investment	156.89	386.75
Nonagricultural output	15.42	41.53
GDP	9.45	24.56
Growth rate (since 1998, in percent, per year)	4.52	4.79
Output per worker (nonagricultural)	15.42	41.53
Capital, nonagricultural.	7.62	33.24
Effective capital	21.07	66.55
Capital per worker	7.62	33.24
Relative capital per worker[3]	0.01	0.05
Share of capital	-0.03	-0.08
Share of labor	0.03	0.08
Real wage	21.71	64.57
Relative wage[3]	0.02	0.06
Return on capital	0.01	-0.02

[1]Percent change from Baseline Projection, except Growth Rate.
[2]Percent of GDP vs. Baseline Projection.
[3]Relative to European level.

How much difference does this make to the simulations? Chart 7 shows the difference in the growth rates relative to the baseline projected with improvements in capital productivity and financial reform in the main simulation and if instead $g = 0.45$ and both g and e rise over time as in the main simulation. While there is a variation of 0.1 to 0.2 percent per year in the growth rate, the magnitude of the effect is quite similar in both cases. Thus, the overall conclusions appear robust to such changes in the underlying assumptions.

V. Conclusions

In recent years Mongolia has made relatively good progress towards reforming its government and institutions and making a transition to a market economy, as compared with the poor showing of most Asian members of the CIS. The supply-side growth model assumes that the factors holding Mongolia back from substantially more rapid progress include a backward payments system and inadequate financial institutions hobbled by government ownership, inadequate physical and human capital hampered by government ownership of major industries, together with inadequate saving discouraged by the low return on investment and the hazards of a rickety banking system. Removal of these barriers through privatization of the banks and industry should lead to substantial increases in productivity and investment. The ensuing faster growth should encourage both domestic private saving and foreign capital inflow with substantial additional benefits in the form of increased capital, improved efficiency, and better access to foreign markets. By contrast, failure to adopt these reforms can be expected to leave the Mongolian economy hampered by all of these problems and stagnating with slow growth, as shown in Charts 5 and 6. Whether and when further reforms will be adopted and carried out depends on Mongolian political decisions.

Chart 5. Projected Real GDP Growth in Mongolia

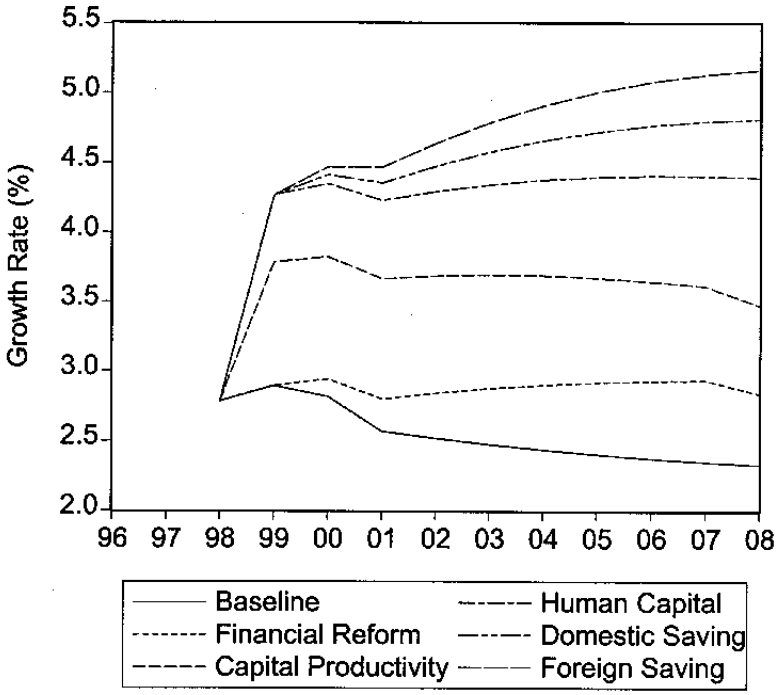


Chart 6. GDP Projections for Mongolia

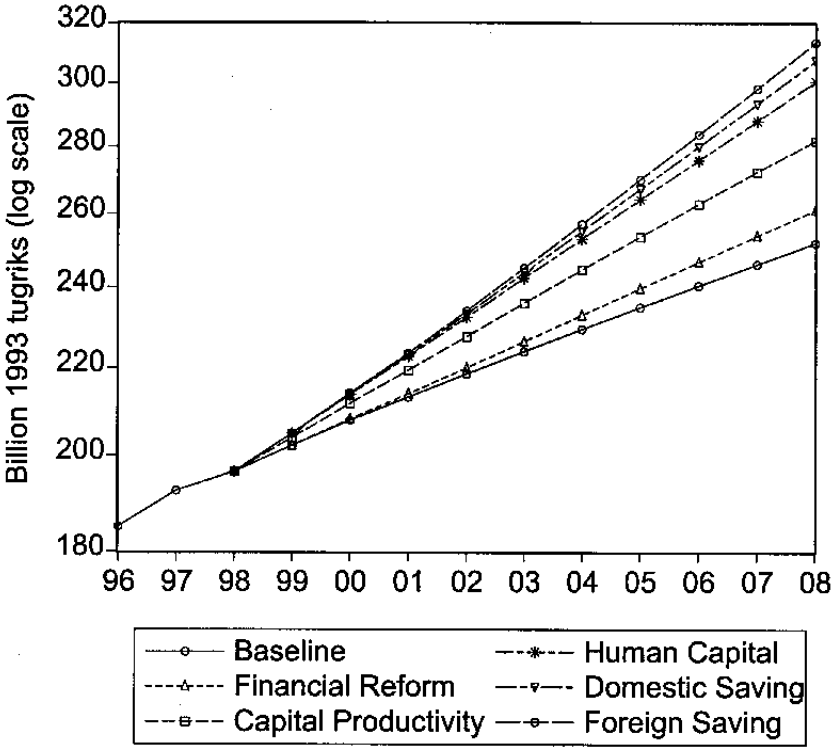
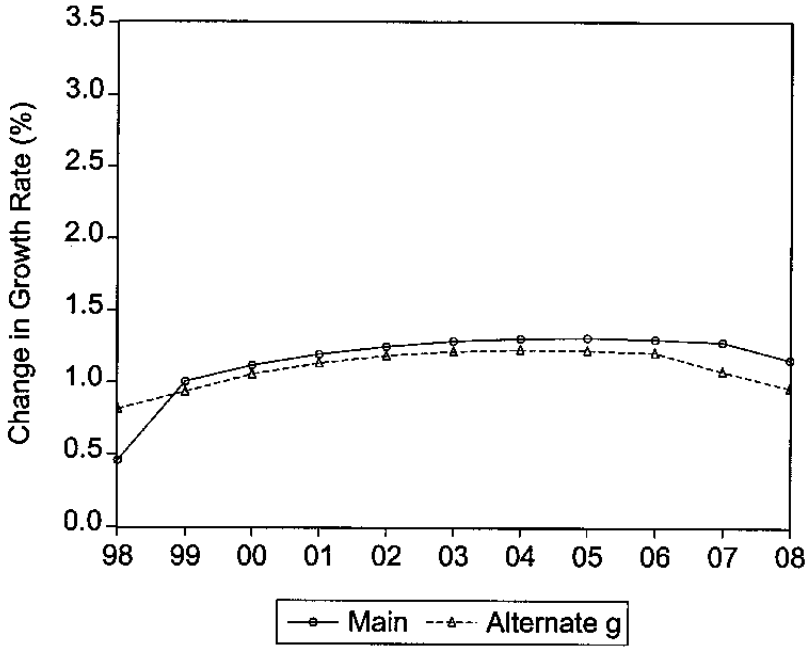


Chart 7. Sensitivity Analysis for Capital Productivity Effect



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The CES production function to be calibrated from Western European data is

$$V = [P_L L^{(\sigma-1)/\sigma} + P_K K^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \quad \text{(A1)}$$

which with $\sigma = 0.5$ becomes

$$V_e = [P_L L_e^{-1} + P_K K_e^{-1}]^{-1} \quad \text{(A2)}$$

The marginal products of labor and capital are $P_L(V/L)^2$ and $P_K(V/K)^2$, respectively.

The inefficient version to be calibrated for Mongolia takes the form

$$V_m = [P_L (h(1+f)L_m)^{-1} + P_K (gK_m)^{-1}]^{-1} \quad \text{(A3)}$$

with $f = .5[(K_m/L_m)/(K_e/L_e)-1]$ where K_e/L_e is the capital labor ratio in Europe and K_m/L_m is the capital labor ratio in Mongolia. See Black and Moersch (1997) and Boote (1992).

Given P_L and P_K and K_e/L_e from Western European data, together with base-year data from Mongolia for V_{m0} and L_{m0}, the calibration exercise requires first assumptions about h and g, the inefficiency parameters, and then inversion of the function $V_{m0} = F[h(1+f)L_{m0}, gK_{m0}]$ to find K_{m0}. The problem is that K_{m0} enters into K_{m0}/L_{m0}. In order to solve for K_{m0} an iterative process is required. Solving (A3) for K_m/L_m gives

$$K_{m0}^{i+1}/L_{m0} = \frac{P_K/g}{\frac{L_{m0}}{V_{m0}} - \frac{P_L}{h(1+.5((K_{mo}^{i}/L_{m0})/(K_e/L_e))-1)}} \quad \textit{(A4)}$$

This equation may be solved iteratively for K_{m0}.