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A United Korea?
Reassessing North Korea Risks (Part I)

- North Korea risks, ranging from war to huge unification costs, warrant a re-evaluation, given the prospect of a power succession in North Korea and the changing economic landscape in the region.
- The North Korean economy is at a crossroads: growth has stagnated and the planned system is near collapse, but it has large untapped potential, including rich human capital, abundant mineral resources (valued at around 140 times 2008 GDP) and significant room for productivity gains.
- We project that the GDP of a united Korea in USD terms could exceed that of France, Germany and possibly Japan in 30-40 years, should the growth potential of North Korea, notably its rich mineral wealth, be realised.
- We expect a gradual integration between the North and South, similar to the pattern followed in China-Hong Kong, rather than an instant German-style unification.
- The costs of the integration of South and North Korea could be reduced to an affordable level, if backed by appropriate policies.

Many thanks to Jim O'Neill, Dominic Wilson and Michael Buchanan for advice and comments, and to Keun Myung Kim for research assistance

Goohoon Kwon
September 21, 2009

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I. North Korea: Risks and opportunities

Investors have long considered North Korea to be a key risk factor when investing in South Korea. The risks relating to North Korea range from the potential for war to huge unification costs (see Fitch's Ratings report of 2003, for example). Hence, tensions in the Korean peninsula or signs of unrest in North Korea have typically led to market sell-offs, although this has been less evident recently (see "Cross-border tensions are rising", *Korea Views*, June 1, 2009).

Recent developments could set in motion powerful political and economic changes in North Korea, potentially transforming the nature of North Korea risks

In this paper, we take a fresh look at the risks relating to North Korea, given the prospect of a succession of power in North Korea and the changing economic landscape in the region. The health of current leader Kim Jong-il, in power since 1994, is widely believed to be poor, prompting press speculation that a transition may already be in progress. More fundamentally, North Korea's economy is increasingly lagging behind its former planned-economy peers—not to mention South Korea; living standards in China and Russia, and more recently in Vietnam and Mongolia, have improved rapidly along with market reforms. These developments, in our view, could eventually spark powerful political and economic changes in North Korea, which, together with the recent political changes in the US and Japan, could transform the nature and magnitude of North Korea risks.

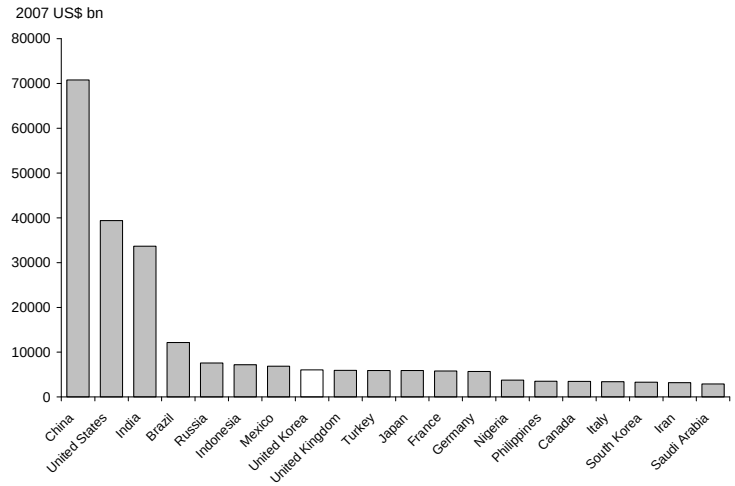
We assume a peaceful and gradual economic integration between North and South Korea

We assume a peaceful and gradual economic integration between North and South Korea in our analysis. Economic integration could take various shapes or forms—from instant unification to a gradual integration—with diametrically different implications for the economy and markets. Experience from Germany's unification suggests that the choice of integration modality may be dictated by the process itself rather than left to the discretion of policymakers. Nonetheless, we believe that our assumption of a peaceful and gradual integration is a reasonable starting point for analysis, given the policy stance of the South Korean government and the international community, and the apparent lack of alternatives for the North Korean leadership other than economic reform and cooperation with neighbouring countries (see "North Korea: Tensions and implications", *Korea Views*, July 17, 2009).

USD GDP of a united Korea in 2050 could potentially be on a par with, or in excess of, that of most G-7 countries

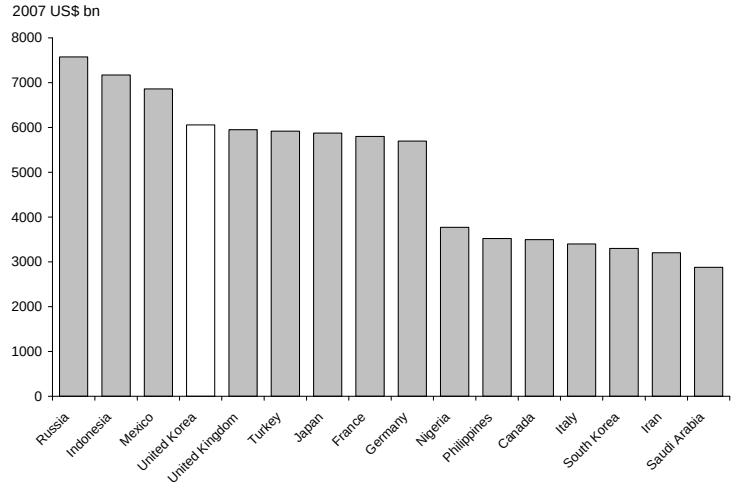
One of the most striking findings of our study is the potential size of a united Korea in the long term. We project that a united Korea could overtake France, Germany and possibly Japan in 30-40 years in terms of GDP in USD terms, should the growth potential of North Korea be realised. This projection would put the size of a united Korea in 2050 firmly on a par with, or in excess of, that of most G-7 countries, except for the US (see Exhibits 1 and 2). We also believe that the cost of the integration of South and North Korea could be reduced to an affordable level, if backed by appropriate policies. This would hold even under the unlikely scenario of a sudden collapse of the North Korea economy.

Exhibit 1: World in 2050 and a United Korea



Source: GS Global ECS Research.

Exhibit 2: World in 2050 and a United Korea (excluding China, US, India and Brazil)



Source: GS Global ECS Research.

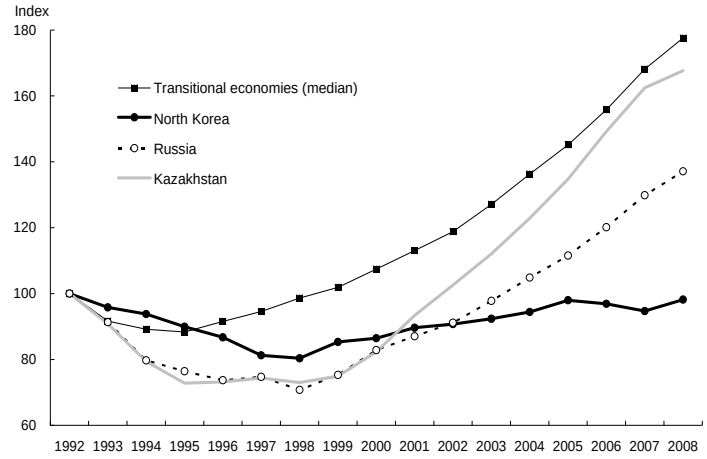
II. North Korea's economy: Implications for a united Korea

The stagnation of recent years has left North Korea lagging far behind its former socialist peers

The North Korean economy is at a crossroads. The economy has already suffered from output contraction following the collapse of the former Soviet Union, which sharply reduced energy supply to North Korea. Output in North Korea fell by 20% from 1992 to the trough in 1998, which was almost as severe as in the transition economies that undertook bold economic reforms (see Exhibit 3). Its output has started to recover since 1998 but the recovery momentum has weakened recently (see Exhibit 4), limiting its per capita income in 2008 at a level 23% lower than in 1990. The stagnation in recent years, together with the strong performance of other former planned economies that embraced market reforms, has left North Korea far behind its former socialist peers, including Mongolia and China (see Exhibit 5). Similarly, its per capita income has declined from 12% of South Korea's in 1993 to 5.5% in 2008, according to Bank of Korea estimates.

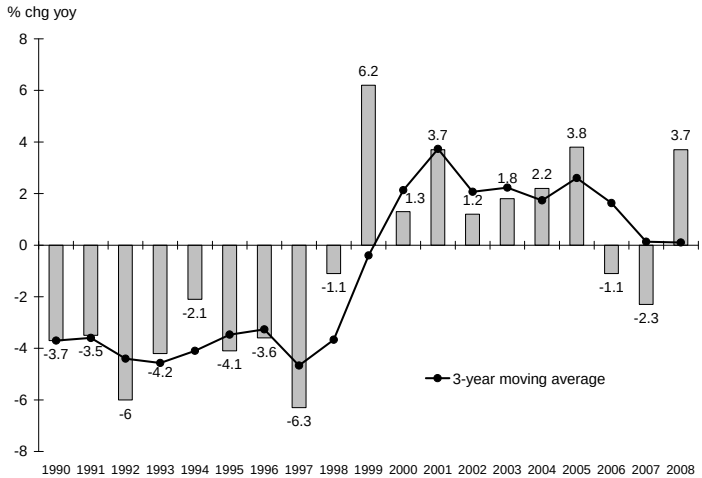
Exhibit 3: North Korea's real GDP is still lower than its 1992 level

Output contraction and recovery in formerly planned economies (real GDP, 1992=100)



Source: Bank of Korea, IMF, GS Global ECS Research.

Exhibit 4: North Korea's economy rebounded in 2008



Source: Bank of Korea, GS Global ECS Research.

Exhibit 5: Per capita income of North Korea in USD is similar to that of Vietnam and India

	North Korea*	Vietnam	Mongolia	India	China	Cambodia	Philippines	Laos
1995	1033	288	631	384	603	297	1055	382
1996	989	338	598	410	701	295	1152	388
1997	812	361	528	426	772	281	1122	357
1998	572	357	480	423	819	253	867	255
1999	714	374	441	449	865	281	992	286
2000	757	402	455	451	949	288	989	329
2001	706	413	482	459	1042	309	906	327
2002	762	440	518	480	1135	327	958	331
2003	818	492	582	559	1274	349	973	380
2004	913	553	720	645	1490	394	1040	433
2005	1056	639	905	734	1715	455	1159	485
2006	1108	723	1224	816	2028	513	1352	582
2007	1151	834	1503	1035	2567	649	1624	675
2008	1067	1034	1981	1005	3267	818	1845	841

*Bank of Korea's estimates in KRW, which we have converted to USD at market exchange

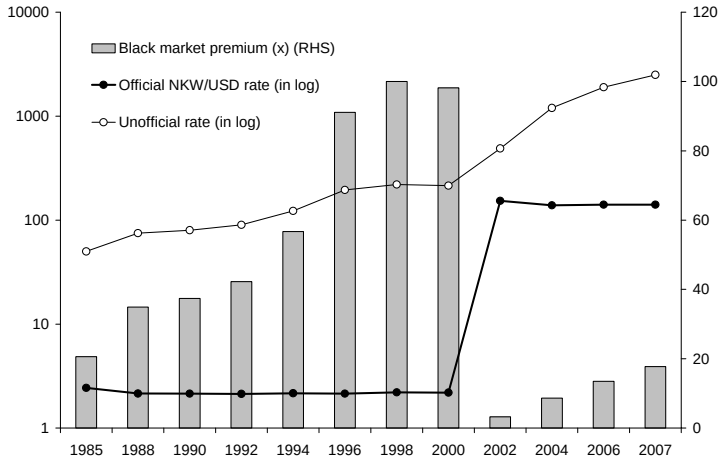
Note: Caution is needed in its direct comparison with those of other countries as the estimates are based on South Korean price and cost structures.

Source: CEIC, IMF, Bank of Korea, GS Global ECS Research.

The planned economy system in North Korea appears to be on the verge of collapse. The unofficial USD exchange rate has surged after a brief period of stability following the 2002 devaluation (from NKW2.2 to NKW153.5), reaching 20 times the official rate in 2007 and about 30 times the official rate in early 2009 (see Exhibit 6) (IMF and SNU, 2009, and Congressional Research Service, 2009). Official wages do not carry much weight either. On paper, official living expenses (akin to wages) of NKW2000-6000 per month would buy 43kg-130kg of rice, but in reality this would only buy up to 3kg of rice in the markets given acute shortages in state rice supplies, implying severely repressed inflation in consumer goods. According to anecdotal evidence from refugees, households use state-owned shops for just 1% of their purchases, and official compensation represents less than 10% of their income, with the remainder coming from private activities (mostly retail trading) (Bank of Korea, 2007). The military establishment is probably the only sector still benefiting from the planned system; it absorbs at least 20%-30% of GDP compared with around 3% of GDP in South Korea (Rand, 2005, and US State Department).

The current economic system looks unsustainable

Exhibit 6: North Korea has large pent-up devaluation pressure (USD/NKW)



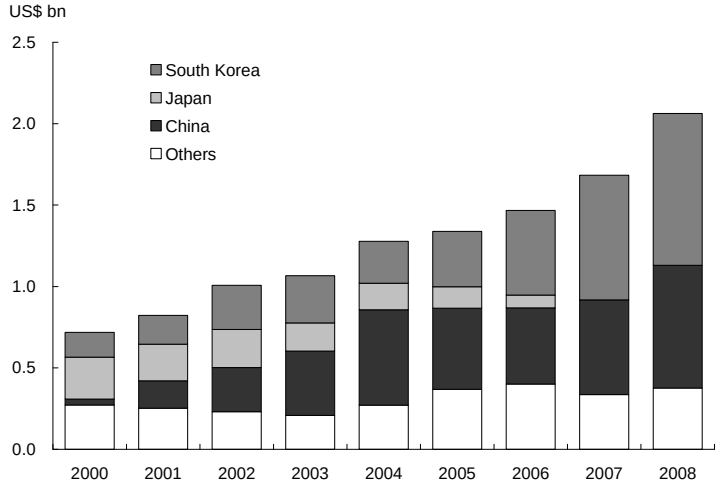
Source: Bank of Korea, IMF and SNU (2009), GS Global ECS Research.

Closer economic ties with South Korea. Thanks to a decade of concerted efforts on the part of the South to improve economic links with the North, South Korea is already North Korea's largest export market, replacing China for the first time in 2007 (see Exhibit 7). The fact that the Gaesung Industrial Complex (GIC) in North Korea, which accounts for about half of inter-Korean trade, continued to operate even amid escalating tensions early this year, testifies to the importance of intra-Korean economic cooperation as perceived by the North Korean leadership and by South Korea (see Box 1 on the GIC on page 12). Ongoing UN sanctions are likely to help maintain or bolster intra-Korean economic cooperation, possibly including the expansion of the GIC, given that the sanctions are not applied to most intra-Korean trade. North Korea has implemented a host of conciliatory measures recently, including the release of detained South Korean fishermen, the lifting of movement restrictions into and out of the GIC, and an amicable resolution of a wage dispute in the GIC.

South Korea is already North Korea's largest export market

Exhibit 7: South Korea is North Korea's largest export market

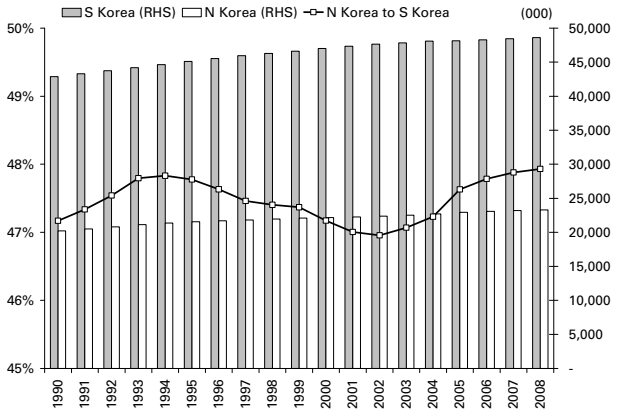
Exports of North Korea in US$ bn including exports to South Korea



Source: Korea Development Institute, Korea Trade-Investment Promotion Agency, GS Global ECS Research.

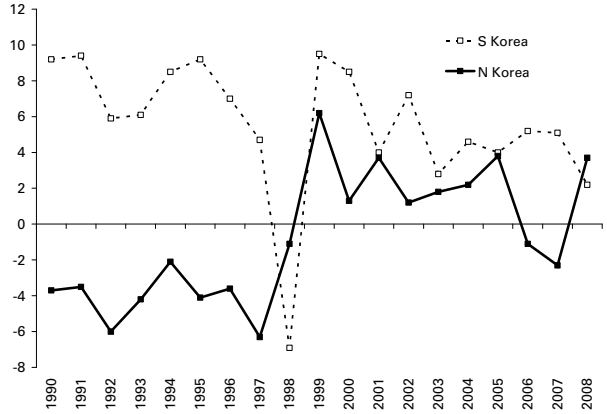
Korea at a glance

Population



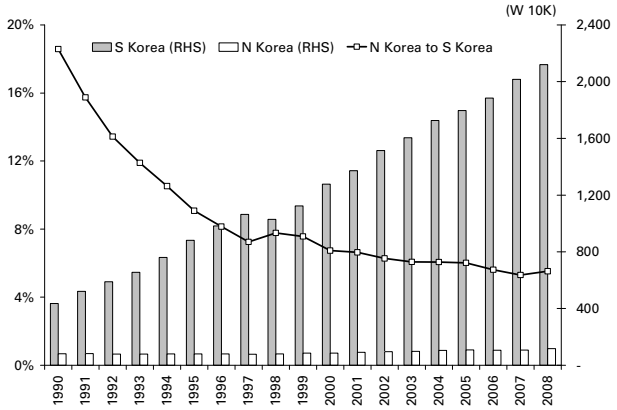
Source: Bank of Korea.

Real GDP yoy growth rate



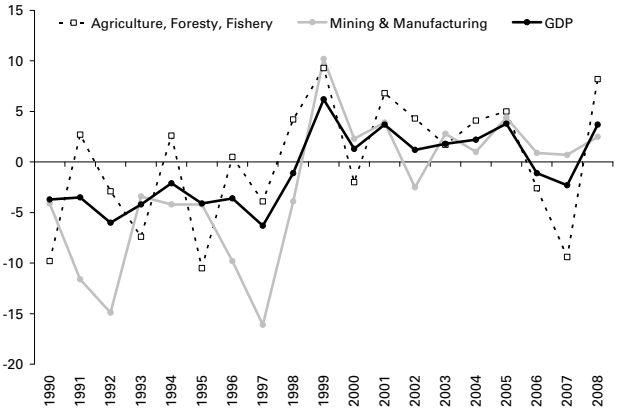
Source: Bank of Korea.

Gross National Income per capita



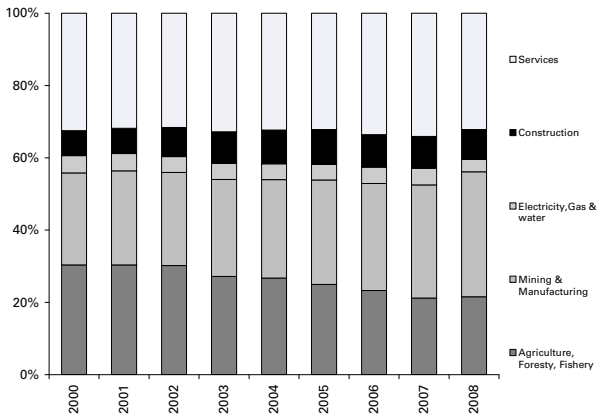
Source: Bank of Korea.

North Korea's GDP yoy growth (% chg by industry)



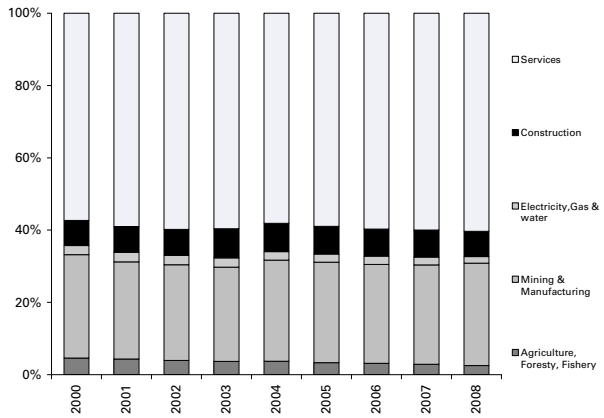
Source: Bank of Korea.

North Korea's industrial structure



Source: Bank of Korea.

South Korea's industrial structure



Source: Bank of Korea.

III. North Korea's long-term growth potential

Meaningful economic reforms and closer South-North economic ties will influence how quickly North Korea can realise its growth potential

Assessing the growth potential of North Korea is a huge challenge. The lack of data on North Korea poses fundamental problems when estimating input prospects and productivity potential. Output data are sketchy and difficult to verify, probably in part due to the large military sector (some 25% of GDP). More importantly, the timing and pace at which North Korea will realise its growth potential is likely to hinge on when and whether it embarks on meaningful economic reforms, and the extent of economic integration between South and North Korea—both of which are difficult to predict as of now.

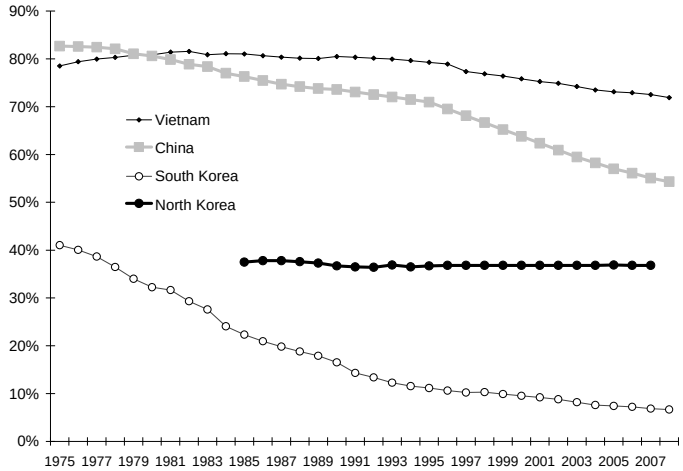
That said, we believe that North Korea has strong untapped potential, which could be unleashed once meaningful economic reforms start and investment flows in. We would highlight three main factors: 1) an abundant and competitive labour force; 2) ample room for synergies between South Korean capital and technology, and North Korean natural resources and labour; and 3) the potentially large gains from productivity and currency appreciation typical in transition economies.

Abundant and competitive labour force

Per capita income similar to that of Vietnam and India, and about one third of China's

An abundant and competitive labour force provides a favourable economic backdrop that could trigger a growth spurt, once economic reforms are undertaken. Per capita income stood at around US$1,100 in 2008 at market prices (Bank of Korea estimates) or around US$1,700-2,248 in purchasing-power-parity values (Congressional Research Service 2009). The per capita income at market prices is similar to that of Vietnam and India, and about one-third of China's, all of which benefit from competitive wages and a large domestic demand pool. Living standards could be much lower than implied by per capita GDP, given the large military sector, repressed inflation and shortage of consumer goods. In addition, more than a third of the population (37%) lives in rural areas, as was the case in South Korea in the late 1970s, providing an ample pool for the industrial workforce (see Exhibit 8). Mirroring the population structure, the primary sector represents about 22% of GDP, also similar to that of South Korea in the late 1970s (see Exhibit 9).

Exhibit 8: Rural population in North Korea is at the level of South Korea in the late 1970s



Source: CEIC, National Statistical Office, GS Global ECS Research.

Exhibit 9: The North's industrial structure is also similar to that of South Korea in the late 1970s

	North Korea ('08)	South Korea ('08)	South Korea ('79)
Agriculture and fishing	21.6	2.5	21.3
Mining	12.1	0.2	1.1
Manufacturing	22.5	28.1	24.7
Light	6.7	4.6	...
Heavy and petrochem	15.8	23.5	...
Electricity, gas and wate	3.4	1.8	2.2
Construction	8.3	7.0	7.9
Services	32.2	60.3	42.7
Government	22.8	10.7	...
Others	9.4	49.6	...
Total	100.0	100.0	100.0

Source: Bank of Korea, GS Global ECS Research.

Strong synergies between South and North Korea

North Korea's mineral wealth valued at 140 times 2008 GDP

North Korea is rich in minerals, unlike South Korea. It has large potential deposits of minerals, including magnesite, coal, uranium and iron ore, valued at around 140 times North Korea's 2008 GDP at current market prices (see Exhibit 10). We estimate its implied net present value (NPV) at around 18 times GDP, assuming a reserve life of 40 years, a discount rate of 18% and wage costs of 15% of sales. In contrast, South Korea has virtually no mineral resources: it imports 97% of the energy and mineral resources Korea uses. Most of the six strategic minerals for South Korea (bituminous coal, uranium, iron, copper, steel and nickel) are abundant in North Korea. The following section examines the implications of these large mineral resources for North Korea's long-term growth potential.

Exhibit 10: North Korea is rich (and South Korea is poor) in mineral resources

		North Korea		South Korea	
	Unit	Reserves	Value (KRW trn)	Reserves	Import %
Magnesite	bn ton	6.0	1,376	-	100
Limestone	bn ton	100	996	10	1
Uranium ore	000 ton	4,000	628	-	100
Lignite	bn ton	16	343	-	100
Anthracite coal	bn ton	4.5	257	1.4	65
Iron	bn ton	5.0	214	0.02	99
Gold	000 ton	2	45.3	0.04	93
Zinc	000 ton	21,000	12.6	588	100
Lead	000 ton	10,600	9.12	404	100
Copper	000 ton	2,900	5.41	56	100
Silver	000 ton	3-5	1.86	1.58	95
Molybdenum	000 ton	54	1.13	22	99
Rosette graphite	000 ton	2,000	0.75	121	100
Tungsten trioxid	000 ton	246	0.39	127	89
Barite	000 ton	2,100	0.22	842	100
Fluorspar	000 ton	500	0.08	477	100
Talcum	000 ton	700	0.06	8,152	92
Kaolinite	000 ton	2,000	0.03	106,335	11
Manganese	000 ton	100-300	0.01	176	100
Nickel	000 ton	10-20	0.00	-	100
Asbestos	000 ton	13	0.00	511	-
Total (times 2008 GDP)			142		

Note: Reserves for South Korea are the sum of confirmed and estimated reserves as of 2007. North Korean data are potential reserves, based on latest North Korea data.
Source: Korea Resources Corporation, Korea Institute for National Unification, Hyundai Research Institute, IAEA, EIA, GS Global ECS Research.

North Korea also has favourable demographics and a well-educated labour force. We estimate that, in all, the labour force in North Korea could increase by as much as 1.4% per year over a decade under an integration scenario. First, its demographics are relatively young and the population is growing roughly twice as fast as in South Korea (see Exhibit 11). The working age population, according to 2008 UN projections, will grow at 0.7% a year over the next 10 years, compared with zero growth in South Korea. The combined population of North and South Korea could reach 76 million at the peak under a status quo scenario, according to UN projections, and possibly more under an integration scenario, in which life expectancy would be expected to rise in North Korea (see Exhibit 10). Second, with closer inter-Korean integration, the labour force could increase substantially given the current large military population (nearly 1.3 million or 16% of males between the ages of 15 and 64). As for the quality of human capital, pre-college education is compulsory (up to the age of 16) and is provided by the state. In fact, experience from the Gaesung Industrial Complex suggests that North Korean workers have a strong work ethic and a good potential for productivity enhancement (see Box 1 on page 12).

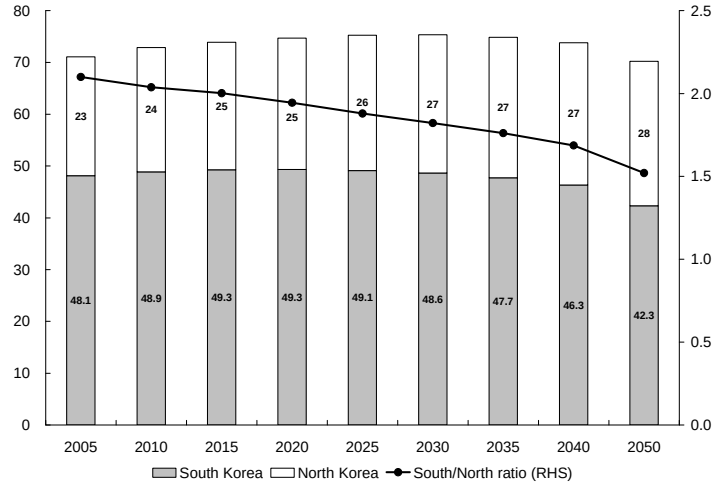
Working age population predicted to grow at 0.7% a year over the next decade vs zero growth in South Korea

Exhibit 11: North Korea has more favourable demographics than the South (2007)

	South Korea	North Korea	United Korea
Demographic composition (in % of total)			
0-14 years	18	23	20
15-64 years	72	68	71
65 or over	10	9	9
Birth rate per 1000	9.9	15.1	11.6
Death rate per 1000	6.0	7.2	6.4
Annual population growth	**0.4**	**0.8**	**0.5**

Source: UN, CIA, GS Global ECS Research.

Exhibit 12: Population of a united Korea could near 80 million at its peak in 2030



Source: UN, National Statistical Office, GS Global ECS Research.

Box 1: The Gaesung Industrial Complex

The Gaesung Industrial Complex (GIC) is the first industrial park to exist in North Korea, and is operated jointly by North and South Korean entities. It came into being in 2004, following approval by the South Korean government and the enactment of a special law by the North in late 2002.

Since it opened in 2004, the number of companies operating in the GIC has increased to 109 (as of July 2009), with 24 factory sites under construction. Production in the GIC has correspondingly increased sharply from $15 million in 2005 to $251 million in 2008 (see Exhibit B1), with production reaching 22% of total exports of North Korea in 2008. South Korea has so far invested W790 billion, about 55% of which by private companies and the remainder by the government and state-owned companies (see Exhibit B2). Given the political and operational risks involved, the Korean government provides special insurance to these companies, which could be compensated for up to 90% of investments.

One of the primary incentives for Korean companies to operate in the GIC is the competitive labour force: GIC workers earn $73 per month (around $40 net of taxes and social contributions), compared with $2,400 in South Korea in 2008. The GIC compensation, paid in USD, may seem low relative to a per capita GDP of about $1,100, but the hard currency payments would still be attractive to GIC workers, given repressed inflation and a shortage of consumer goods. North Korea demanded a drastic increase of the minimum wage in April this year to $300 per month from $55, but eventually settled for a 5% increase.

The GIC is more than symbolic to North Korea, given that it provides incomes to some 160,000 people, including 40,000 employees. Interviews with South Korean companies suggest that North Korean workers possess a sound work ethic and Confucian values, are well-educated and have significant potential for productivity enhancement.

Exhibit B1: The GIC's output is growing rapidly

(In US$ million and in % of North Korea exports)

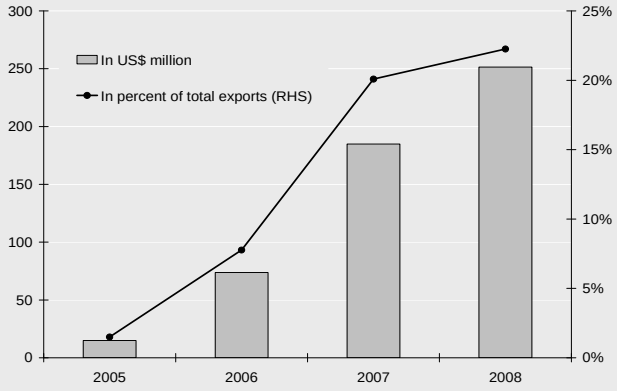
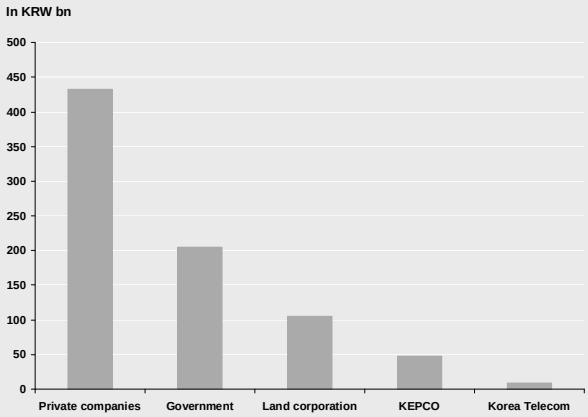


Exhibit B2: Investment in the GIC

(Investment in KRW billion)



Source: Ministry of Strategy and Finance, GS Global ECS Research.

Productivity gains and currency appreciation

The experience of transition economies suggests that the North Korean economy could benefit substantially from productivity gains and currency appreciation once economic reforms take hold. The output of the Eastern European and CIS transition economies grew 6.2% per annum from trough levels, following large initial output losses following the collapse of the planned economy (see Exhibit 13). Asian transition economies performed considerably better, with average annual growth of 8.4% over 1992-2008, and without much of the initial output contraction. Productivity growth, not explained by investment and employment growth, accounted for nearly 40% of total growth over 1996-2006 in transition economies (IMF WP/07/164), indicating that a sizeable part of GDP growth in transition economies has come from better allocation of resources and a more efficient use of existing resources. To the extent that North Korea has already experienced output shocks following the dismantling of the Soviet Union, as we noted before, its growth performance under market economy reforms could resemble that of China, Vietnam and Mongolia, rather than the Eastern European and CIS countries. This puts North Korea's growth potential conservatively at around 7%-8% per annum should North Korea pursue economic reforms and economic integration with South Korea.

We estimate North Korea's growth potential conservatively at around 7%-8% pa should it pursue integration with the South

Exhibit 13: Output decline and recovery in transition economies

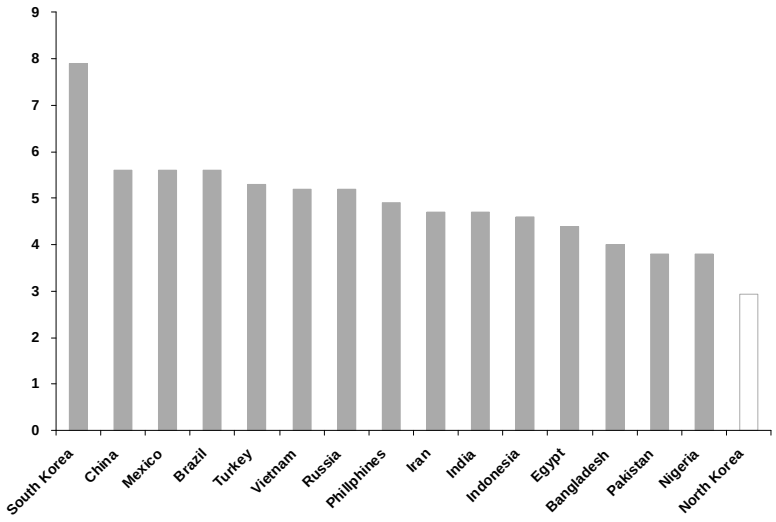
	Trough year in real GDP	Total declines since 1992 before recovery	Avg growth from the trough year or 1992 to 2008	Real GDP in 2008 (1992=100)
Armenia	1993	-14.1%	8.8%	305
Azerbaijan	1995	-46.3%	12.1%	236
Belarus	1995	-27.6%	7.5%	185
Albania	1992	NM	6.4%	269
Georgia	1994	NM	6.5%	242
Kazakhstan	1995	-27.2%	6.6%	168
Kyrgyz Republic	1995	-34.2%	5.1%	125
Bulgaria	1997	-27.5%	5.2%	126
Moldova	1999	-41.9%	5.9%	98
Russia	1998	-29.2%	6.8%	137
Tajikistan	1996	-41.5%	7.3%	137
Turkmenistan	1997	-42.8%	14.1%	243
Ukraine	1999	-50.4%	6.8%	90
Uzbekistan	1995	-8.3%	5.3%	180
Czech Republic	1992	NM	3.2%	167
Slovak Republic	1993	NM	5.2%	229
Estonia	1994	-1.6%	6.2%	201
Latvia	1993	-11.4%	5.6%	201
Hungary	1993	-0.6%	3.6%	168
Lithuania	1994	-24.4%	5.9%	170
Croatia	1993	-8.0%	4.3%	172
Slovenia	1992	NM	4.3%	195
Macedonia, Former Yugo	1995	-10.2%	2.8%	129
Poland	1991	NM	4.5%	211
Romania	1992	NM	3.5%	173
Europan average		**-24.8%**	**6.1%**	
China	na	NM	10.2%	470
Mongolia	1993	-3.0%	5.5%	217
Vietnam	na	NM	7.6%	323
Asian average		**-3.0%**	**7.8%**	
Asian and European average		**-13.9%**	**6.9%**	
Memorandum item:				
United States	na	NM	2.9%	159
North Korea	1988	NM	2.0%	98
South Korea	na	NM	5.0%	219

Source: IMF, GS Global ECS Research.

The significant room for productivity gains is supported by our Growth Environment Scores (GES). Our analysis of GES for transition economies shows that the combination of high human capital and yet poor macro and political infrastructure elevates the growth potential for transition economies. In other words, they have a lot of latent potential that has yet to be unlocked if macro and political stability and investment follow through with reforms and integration with South Korea. In addition, we find that even allowing for improvements in the GES scores as transition occurs, transition economies seem to manage a reasonably lengthy spurt of additional growth over and above what their growth conditions alone would predict in our models (in China, Vietnam and, to a certain extent, in Russia). Presumably, this is because the organisation of resources is so poor that there is scope for relatively easy gains early, since income levels are much lower than the economy's underlying human capital would normally suggest they should be. Furthermore, North Korea's very low indicative GES score, together with a very high GES for South Korea (see Exhibit 14) point to a large upside potential as growth gains from improving GES tends to be higher for countries with lower incomes and lower GES (see "You reap what you sow", *Global Economics Paper*, No: 148, our 2006 Growth Environment Scores).

Transition economies tend to have substantial growth potential

Exhibit 14: Growth Environment Scores for BRICs and N-11 (2008)*

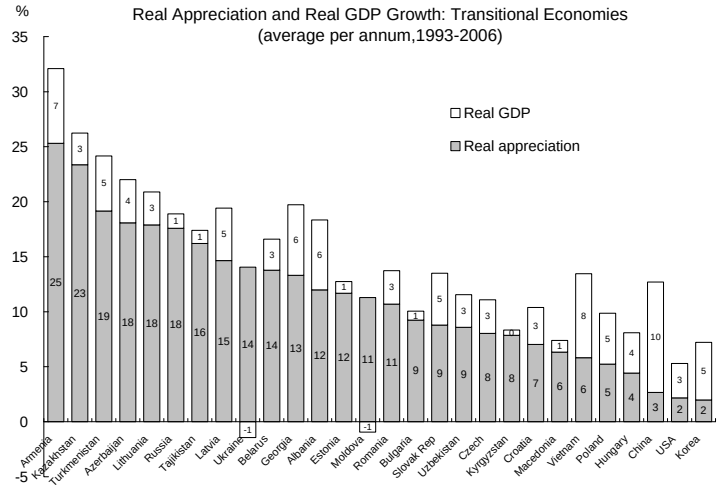


*The North Korea score is a tentative one, based on our estimates of the 13 GES indicators.
Source: GS Global ECS Research.

The experience of transition economies suggests also that the purchasing power of North Koreans, as measured by USD GDP, could grow much faster than real GDP. GDP in USD terms in transition economies increased, on average, tenfold over 15 years (see Exhibit 15), with 80% of the growth coming from real exchange rate appreciation (see Exhibit 16). The appreciation was particularly rapid for resource-rich countries: Kazakhstan, Azerbaijan, Russia and Mongolia took only 3-4 years to double their USD GDP. This largely reflects the fact that non-tradable goods prices in planned economies used to be heavily discounted as part of social policy, although the improvement in productivity in the tradable sector has also played a role in the real appreciation. In fact, data for North Korea point to significant room for relative price adjustment and real appreciation—relative prices for housing and transportation in North Korea compared with in South Korea are over 100 times cheaper than relative prices of rice and energy (see Exhibit 16).

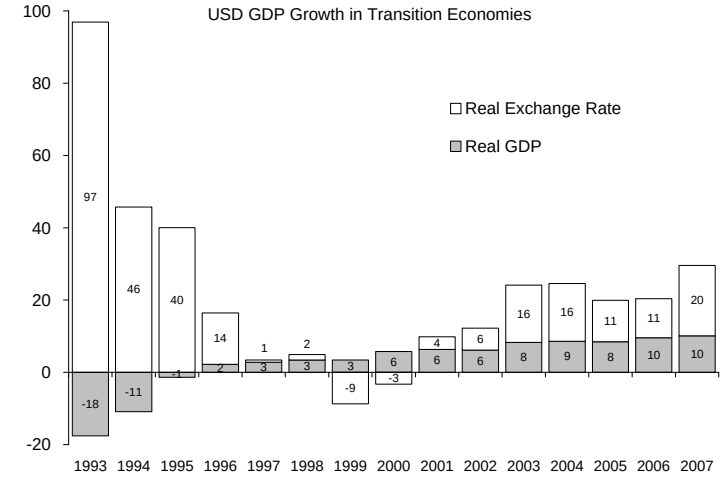
Past experience suggests that purchasing power could grow much faster than real GDP

Exhibit 15: Currencies in most transition economies strengthened more rapidly than output growth



Source: IMF, GS Global ECS Research.

Exhibit 16: Real appreciation accounted for 80% of USD GDP growth in transition economies over 1993-2007



Source: IMF, GS Global ECS Research.

Exhibit 17: Price structures of North and South Korea differ widely

Item	Unit	South Korea (KRW;2008)	North Korea (NKW;2002)	PPP rates (KRW/NKW)
Electricity	kwh	55	2.1	26
Diesel	kl	1,465	38	39
Rice	kg	2,705	43	63
Bus Fare	1 use	1,000	2.0	500
Subway fare	1 use	1,000	2.0	500
House rent 1/	m^2	19,697	2.0	9,848
House rent 2/	m^2	179,341	2.0	89,670

1/ Pyongyang for North Korea, and minimum nation- wide Apt prices for South K
2/ Pyongyang for North Korea, and average Seoul Apt prices for South Korea.

Source: IMF and SNU (2009), GS Global ECS Research.

IV. A united Korea—the potential size of the economy

Long-term projection for a united Korean economy

We undertake a long-term projection to assess the potential upside of a united Korean economy. For the projection, we divide the integration process into three phases: the first as a transition period of 15 years (2013-2027) once the integration process has commenced, the second as a consolidation phase of 10 years (2028-2037), when growth in North Korea is likely to slow, and the third as a maturing phase (2038-2050) when the growth rates for the two should converge. It should be noted that the projection is highly indicative, given the lack of reliable economic data on North Korea, and the sensitivity of the outcomes to the modality and pace of inter-Korean integration.

We project an average growth rate of 7% for North Korea…

The following summarises our key assumptions and main findings:

- Our projection assumes that North Korea's real GDP could grow at 7% on average during the first phase, towards the lower end of Asian transition economies' performance, before slowing gradually thereafter to 2% by 2050. Over the whole projection period, this translates into an average growth rate of 5.5%—a conservative assumption, compared with the 7% growth rate used in a recent study by the Korea Tax Institute.

…and an 11% pa currency appreciation over 15 years

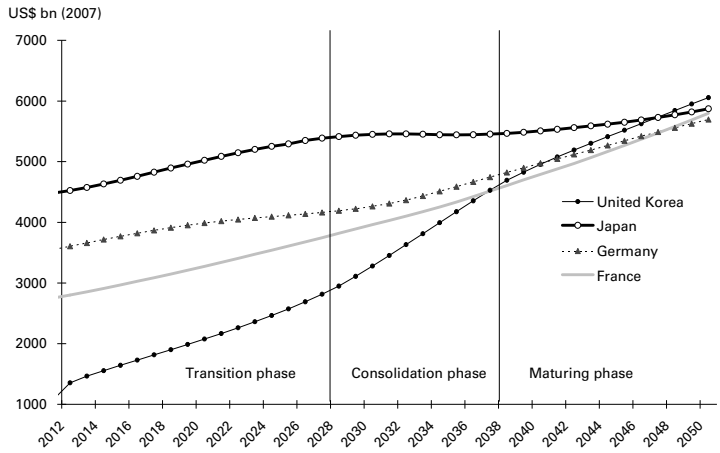
- We also assume that North Korea's currency appreciates at the average pace of other transition economies, that is, 11% per annum over 15 years. The real appreciation assumption differentiates our projection from those of other studies on inter-Korean integration, which do not explicitly factor in the scope for real appreciation.

- For South Korea, we assume a 0.3% increase in the trend growth, supported by higher investment and economies of scale during integration.

- Under these assumptions, the GDP of a united Korea in USD terms could exceed those of France, Germany and Japan in 30-40 years (see Exhibit 18). Per capita income in North Korea could reach half of the South Korean level in 20 years after the start of integration (see Exhibit 19). The baseline long-term growth rates for South Korea and other countries used for comparison are from "The Expanding Middle: The exploding world middle class and falling global inequality", *Global Economics Paper* No. 170, July 7, 2008.

USD GDP of a united Korea could exceed that of France, Germany and Japan in 30-40 years

Exhibit 18: The GDP (in USD terms) of a united Korea could exceed that of France, Japan and Germany in 30-40 years



Source: GS Global ECS Research.

Exhibit 19: United Korea—indicative long-term projections

Real GDP Index (2008 trn KRW)	United Korea	South Korea	North Korea	yoy% (average per annum) United Korea	South Korea	North Korea
2010	1090	1062	28	2%	2%	1%
2015	1353	1317	35	4%	4%	5%
2020	1609	1559	49	4%	3%	7%
2025	1855	1786	69	3%	3%	7%
2030	2097	2001	96	2%	2%	7%
2035	2324	2197	128	2%	2%	6%
2040	2570	2405	165	2%	2%	5%
2045	2793	2600	193	2%	2%	3%
2050	3027	2812	215	2%	2%	2%

USDGDP (2007 USD bn)	United Korea	South Korea	North Korea	yoy% (average per annum) United Korea	South Korea	North Korea
2010	$943	$917	$26	-1%	-1%	2%
2015	$1,643	$1,596	$47	12%	12%	12%
2020	$2,077	$1,964	$113	5%	4%	19%
2025	$2,574	$2,299	$274	4%	3%	19%
2030	$3,280	$2,645	$635	5%	3%	18%
2035	$4,176	$3,051	$1,125	5%	3%	12%
2040	$4,956	$3,448	$1,508	3%	2%	6%
2045	$5,519	$3,747	$1,772	2%	2%	3%
2050	$6,056	$4,073	$1,982	2%	2%	2%

Per capita income (2007 USD1000)	United Korea	South Korea	North Korea	Real appreciation yoy% United Korea	South Korea	North Korea
2010	$13	$19	$1	-2%	-3%	1%
2015	$22	$32	$2	7%	7%	7%
2020	$28	$40	$4	1%	1%	12%
2025	$34	$47	$10	1%	0%	12%
2030	$43	$54	$23	1%	1%	11%
2035	$55	$64	$40	1%	1%	6%
2040	$66	$74	$53	1%	1%	1%
2045	$76	$84	$62	0%	0%	0%
2050	$86	$96	$70	0%	0%	0%

Total population (mn)	United Korea	South Korea (mn)	North Korea (mn)	North/South ratio Population	per capita income	USD GDP
2010	73	49	24	49%	6%	3%
2015	74	49	25	51%	6%	3%
2020	75	49	26	52%	11%	6%
2025	76	49	27	54%	22%	12%
2030	76	49	27	56%	43%	24%
2035	76	48	28	58%	63%	37%
2040	75	46	28	61%	72%	44%
2045	73	45	29	64%	74%	47%
2050	71	42	28	67%	72%	49%

Source: Bank of Korea, UN, GS Global ECS Research.

Growth potential of the mineral sector

In order to check the validity of our baseline projections, we estimate growth potentials for North Korea's mineral sector. The conceptual framework is to convert the mineral wealth to financial wealth and estimate three sources of income: the converted financial assets, their investment returns, and wage income from mineral extraction. This approach helps us overcome the inherent difficulties with a direct estimation of North Korea's growth potential we highlighted earlier—notably the lack of basic data and high sensitivity of our projections to the timing and evolution of reforms and integration.

The estimation results support our baseline growth projections. Below is a summary of our key assumptions and main findings:

- We break down the North Korean economy into a mineral sector and a non-mineral sector, drawing on the 2008 GDP estimates by the Bank of Korea. We then take the net present value (NPV) of the known mineral wealth of North Korea (see Exhibit 10), equivalent to about 140 times 2008 GDP.

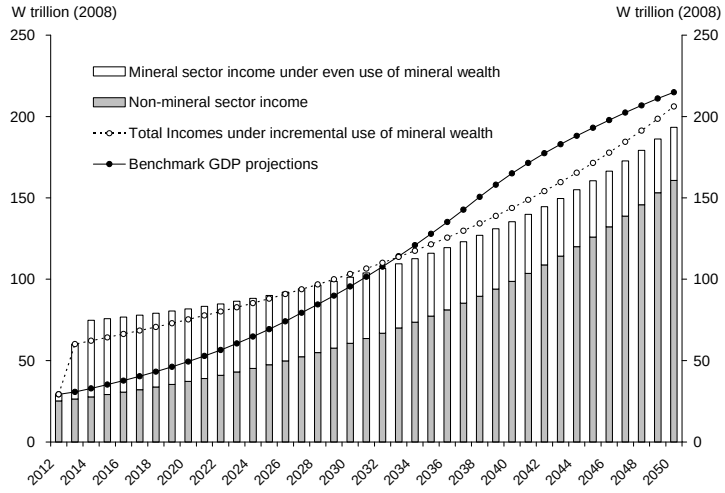
- We convert the mineral wealth to financial assets equivalent to its NPV. This effectively means that North Korea sells the mineral wealth to strategic investors at the NPV price and invests the proceeds in long-term bonds.

- We assume 3% inflation-adjusted annual returns from the bonds through to 2050. We also assume that North Korea earns 15% of mined minerals as wages paid by strategic investors.

- We assume that the non-mineral sector will grow at 5% per annum and that part of the financial assets, together with 3% coupons, are consumed each year, with the balance used up by 2050.

- We estimate North Korea's income at 90% of our benchmark GDP projection in 2050, should the assets be evenly used up, and at 96% if they are consumed incrementally at a constant pace (see Exhibit 20). These results indicate that our benchmark GDP projections are within a reasonable range.

Exhibit 20: North Korea's mineral wealth could provide sizeable income in the long run



Source: Korea Resources Corporation, GS Global ECS Research.

V. Integration costs and policy options

Cost estimates for inter-Korean integration vary widely from 2% to 25% of GDP per annum, depending on the speed of integration and policy assumptions. The most expensive option for South Korea would be the German-style of unification, where South Korea would need to provide large income subsidies to North Korea. Fiscal transfers in the case of Germany were 3.6%-4.6% of GDP a year over 1991-1999 (Swiss Institute for Business Cycle Research 2004). This option would be prohibitively expensive in the case of Korea, given the relatively large difference in incomes (North Korea's per capita income is 6% of South Korea's as opposed to 33% in the German case) and small population gap (North at 48% of South Korea's population versus 27% in the German case) between North and South Korea (IMF 1997) (see Exhibit 21). The least expensive option would be a China/Hong Kong-style integration, which allows two economic and political systems to coexist in a country with limited inter-Korean migration. The post-integration growth performance of China-Hong Kong was better than Germany's, further bolstering the case for gradual integration (see Exhibit 22). Exhibit 23 shows a survey of the literature on inter-Korean integration costs.

A China/Hong Kong-style integration, where two economic and political systems coexist, would be the least expensive option

Exhibit 21: Selected indicators of North and South Korea

	1994			2008			1989		
	North	South	N/S	North	South	N/S	East Ger	West Ger	E/W
Population (million)	23.0	44.5	51.7%	23.3	48.5	48.0%	16.7	61.4	27.2%
Per capital income (US$)	923	10076	9.2%	1064	19231	5.5%	12700	38500	33.0%
Gross National Income (US$b	21.2	448.4	4.7%	24.9	928.7	2.7%	212	2364	9.0%
External trade (% of GNI)	9.9	52.5	18.9%	15.4	92.3	16.6%	50	80.9	61.8%
Exports ($ bn)	0.9	96	0.9%	1.1	422	0.3%	n.a.	n.a.	n.a.
Exchange rate against USD	2.16	802	0.3%	130	1100	11.8%	n.a.	n.a.	n.a.
Government budget (US$ bn)	n.a.	88.3	n.a.	3.5	212.6	1.6%	46.5	78.7	59.1%

Source: Bank of Korea, IMF, OECD.

Exhibit 22: Economic growth of two integration economies

	Before Integration (-5 to -1 year)	After (1 to 5 years)	(6 to 10 years)
East Germany	2.7	1.4	1.9
West Germany	2.3	-0.5	1.8
Hong Kong	4.9	1.4	6.4
China	12.4	8.2	10.6

Source: Bank of Korea (2009).

Exhibit 23: Inter-Korean integration costs—survey of literature

Sources	Research year	Integration period	Costs	Note
Korea Development Institute	1993	2000-2010	$286bn	German style unification
Korea Development Institute	1994	2000	$1000bn	German style unification
Korea Development Bank	1994	1994-2004	$805bn	German style unification (60% income differential)
Korea Development Institute	1997	1995-2005	9-11% of GDP for the first 5 years;7.5% of GDP for the second 5 years	50% income differential
FitchRatings	2003	Over 10-15 years	$15-20bn per year	
Rand Institute	2005	Over 5 years	$50bn-$670bn	To double North Korea GDP within 4-5 years
Samsung Economics Research	2005	2015	$546bn	safety net and industrialization
Bank of Korea	2007	Over 13-39 years	German style: $500-900bn over 22-39 years; Economic zone style: $300-500bn over 13-22 years	To reach North Korea's per-capita income of $10,000

Source: Korea Tax Institute (2008), GS Global ECS Research.

A decade of inter-Korean dialogue suggests that gradual integration similar to the pattern followed in China-Hong Kong, rather than an instant German-style unification, is the most likely integration scenario. After South Korea's engagement policy towards North Korea over the past decade, the two sides have recognised the commonality between South Korea's proposals for a confederation and the North's proposal for a low-level federation, which in turn has led to an agreement to pursue national unification along these lines (Joint Declaration of June 15, 2000). This has, in our view, laid the foundations for a peaceful and gradual integration of the two sides, although follow-through has been bumpy, in part due to the North's nuclear tests in violation of a joint declaration on denuclearisation (1991). Notwithstanding the change in leadership in South Korea in late 2007 and a hardening of North Korea's stance thereafter, we believe that there persists a spirit of reconciliation, cooperation and unification based on mutual respect and trust.

A decade of inter-Korean dialogue suggests that gradual integration is the most likely scenario

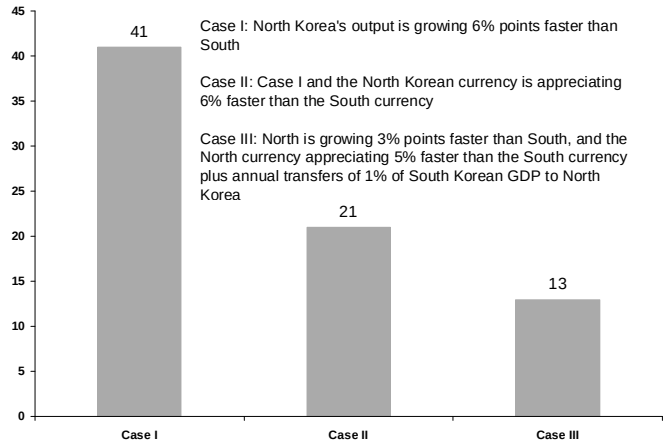
The political backdrop in the region is also supportive of peaceful and gradual integration, in our view. A strong, united stance of neighbouring countries on the nuclear issue is likely to lead to a lasting and comprehensive solution of North Korea risks. A recent change in the political leadership in Japan could support a negotiated solution by providing the prospects of improved Japan-North Korea relations and international financial assistance.

We believe that the integration costs of South and North Korea could be reduced to an affordable level, if backed by appropriate polices. Our projections above show that North Korea's per capita income could reach half that of South Korea about 20 years after the onset of integration, through sizeable currency appreciation as well as rapid GDP growth in North Korea. The maintenance of a flexible exchange regime in North Korea would help achieve this without inducing inflation-driven appreciation, as would typically be the case under an exchange rate peg. We estimate that output growth and currency appreciation under the flexible rate regime, together with annual transfers of 1% of GDP from the South, could shorten the time needed to reach half the income level of South Korea to 13 years (see Exhibit 24). Other important economic policies in North Korea would include: a monetary policy that promotes price stability, fiscal policy focusing on infrastructure development and a social safety net, and structural reforms to help free up resources for lasting growth and foster sound and efficient financial intermediation. Given the importance of the mining sector for investment and job growth in North Korea, the introduction of transparent and sustainable investment schemes for mineral resources would be one of most critical factors for success.

We believe that the integration costs are affordable if backed by appropriate polices

Exhibit 24: Illustrative scenario of a North-South income convergence

(Number of years for North Korea's per-capita income to reach half of the South Korea level)



Source: Bank of Korea, GS Global ECS Research.

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