



# PEOPLE'S REPUBLIC OF CHINA— HONG KONG SPECIAL ADMINISTRATIVE REGION

## SELECTED ISSUES

January 2019

This Selected Issues paper on the People's Republic of China was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed on December 20, 2018.

Copies of this report are available to the public from

International Monetary Fund • Publication Services  
PO Box 92780 • Washington, D.C. 20090  
Telephone: (202) 623-7430 • Fax: (202) 623-7201  
E-mail: [publications@imf.org](mailto:publications@imf.org) Web: <http://www.imf.org>  
Price: \$18.00 per printed copy

**International Monetary Fund  
Washington, D.C.**



# PEOPLE'S REPUBLIC OF CHINA—HONG KONG SPECIAL ADMINISTRATIVE REGION

## SELECTED ISSUES

December 20, 2018

Approved By  
**Asia and Pacific  
Department**

Prepared By Emilia Jurzyk, Rui Mano, and Ananya Shukla (all APD), Sally Chen (Resident Representative Office, MCM), Alexander Klemm, Sebastian Beer (both FAD), and Sheheryar Malik (MCM).

## CONTENTS

<b>INCOME INEQUALITY IN HONG KONG SAR</b>	3
A. Background	3
B. Empirical Analysis	7
C. Policy Recommendations	12
References	16
<b>TABLES</b>	
1. Panel Regression Estimates of the Drivers of Inequality	14
2. Summary Results from Literature on Growth and Inequality	15
<b>FINANCIAL CONDITIONS AND GROWTH-AT-RISK IN HONG KONG SAR</b>	18
References	23
<b>TABLE</b>	
1. Underlying FCI Variables by Category	18
<b>FIGURE</b>	
1. Changes in Financial Conditions Affect Growth Risks	21

**APPENDIX**

I. Estimation of the Conditional Quantiles \_\_\_\_\_ 24

**POSSIBLE SPILLOVERS FROM INTERNATIONAL TAX REFORMS** \_\_\_\_\_ 27

A. The 2018 U.S. Tax Reform and Other Recent Reforms \_\_\_\_\_ 27

B. Impact on Hong Kong SAR from U.S. Tax Rate Cut \_\_\_\_\_ 28

C. Impact from Other Reforms \_\_\_\_\_ 30

D. Conclusions \_\_\_\_\_ 30

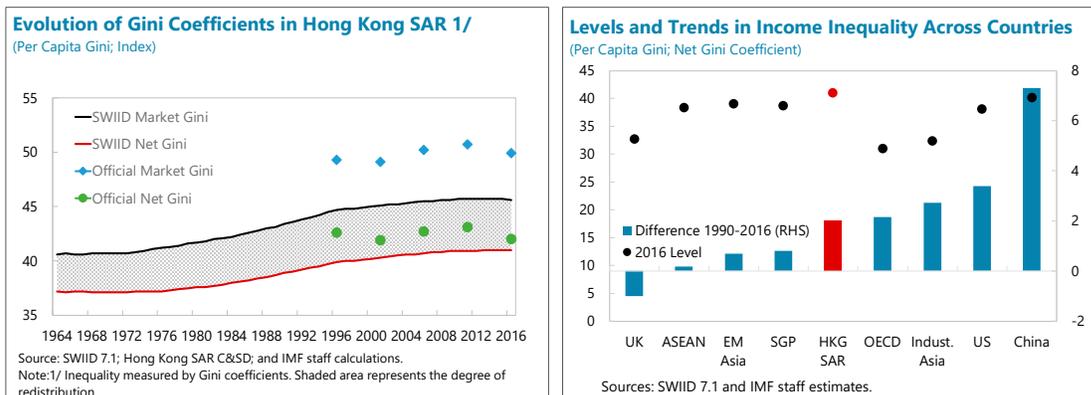
References \_\_\_\_\_ 31

# INCOME INEQUALITY IN HONG KONG SAR<sup>1</sup>

*Income inequality in Hong Kong SAR remains high, despite declining recently. Redistributive policies implemented by the authorities have helped to lower income inequality. But inequality is likely to rise in the medium-term due to aging and thus more needs to be done. A package of policies could lower the Gini index by 3-4 points by 2050 including: more progressive salaries tax; higher reliance on recurrent property taxes; and increased public expenditure on social welfare, health, housing, education and child care. According to recent evidence in the literature, these policies could also boost growth by 0.2-0.5 percentage points per year.*

## A. Background

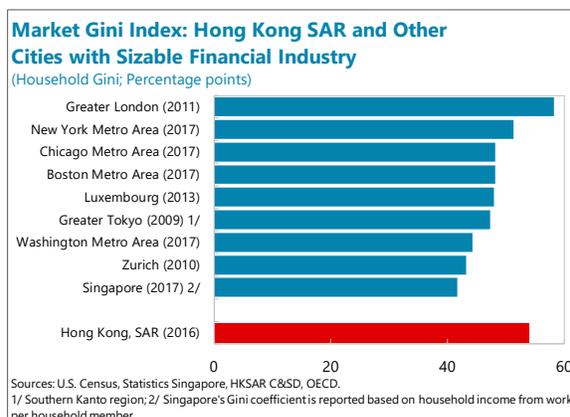
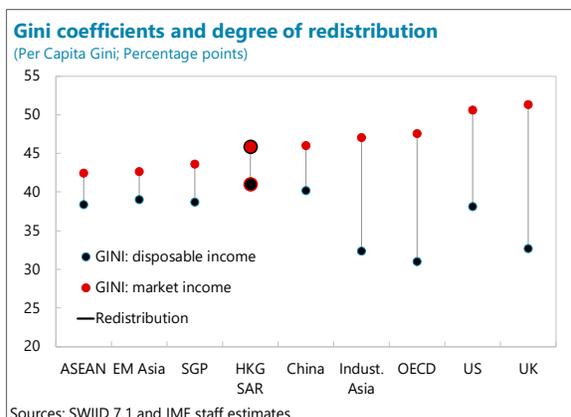
**1. Income inequality in Hong Kong SAR remains high, both historically but also compared to other economies.** The market Gini coefficient, which measures household income inequality prior to taxes and transfers, stood at 49.9 in 2016, while the net Gini coefficient, reflecting the impact of redistributive policies in the form of taxes and transfers, stood at 42. Both coefficients declined compared to the 2011 level, indicating a small reduction in income inequality. Comparison with other economies indicates that inequality in Hong Kong SAR is relatively high, even when measured post taxes and transfers, and it appears higher than in most other cities with large financial centers. That said, the data shows that the increase since 1990 has not been as high as in Mainland China, the U.S. or other advanced economies, both in Asia and elsewhere.<sup>2 3</sup>



<sup>1</sup> Prepared by Emilia Jurzyk, Rui C. Mano, and Ananya Shukla.

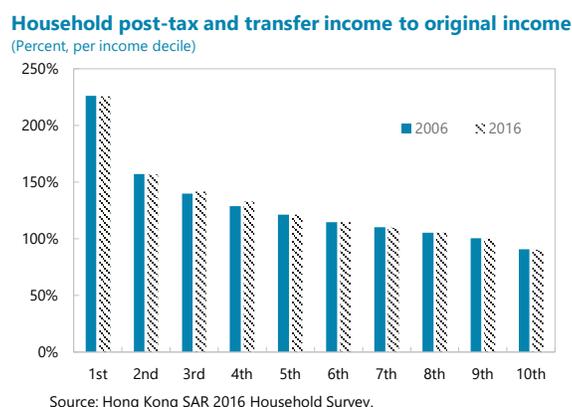
<sup>2</sup> See Box 2 in People's Republic of China—Hong Kong SAR 2016 Article IV Staff Report on discussion of difficulties in comparing Gini coefficients across countries and data sources.

<sup>3</sup> Levels of market and net Gini coefficients used in this paper for Hong Kong SAR differ, as some of the coefficients have been taken from the Hong Kong SAR Census and Statistics Department and from the Standardized World Income Inequality Database on per capita basis, while others are reported on a household level basis (also from the Hong Kong SAR Census and Statistics Department). The narrative, however, remains unchanged.

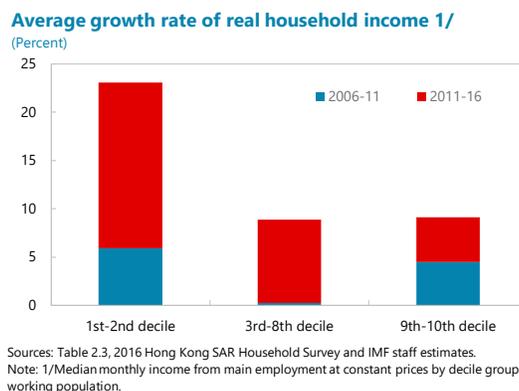


**2. Government policies are helping counteract the effects of rising inequality.** Between 1996 and 2016, market per capita Gini rose by 0.6 points but the net Gini actually declined by 0.6 points, indicating a rising degree of redistribution due to government policies, measured as the difference between the two Gini indices. A similar picture emerges when looking at the long-term trends in the Standardized World Income Inequality Database (SWIID): between 1964 and 2016, the degree of redistribution increased from 3.4 Gini points to 4.6 Gini points. Redistribution in Hong Kong SAR is also higher than in many other economies in Asia, though significantly below levels observed in other advanced economies.

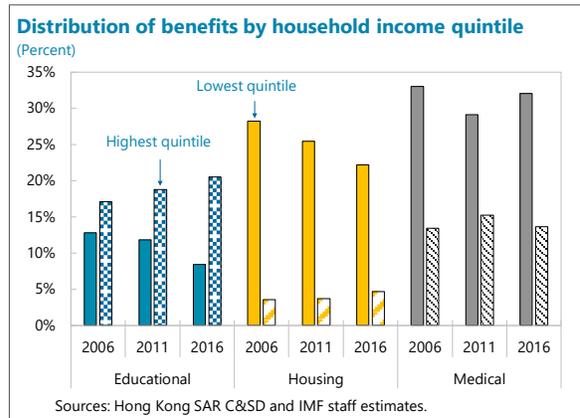
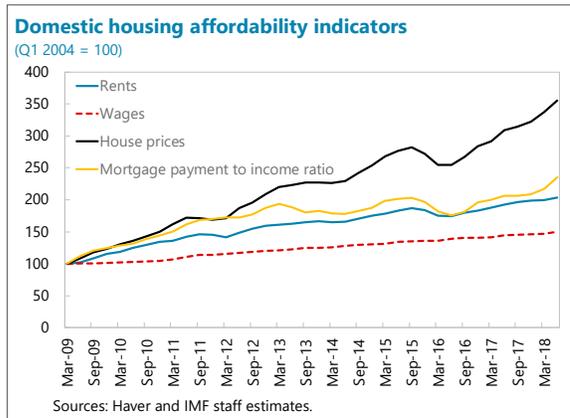
**3. The authorities put in place policies to help those at the bottom of the income distribution.** Progressive taxation rates, a statutory minimum wage introduced in 2011 and increased since, various family and old age allowances, which have been reformed in 2017 and 2018 to further enhance the retirement protection system and social security coverage of working families, transportation subsidies, as well as housing, education, and health benefits, helped counteract income inequality. These policies in total appear to be progressive: when comparing household income post taxes and social transfers, households in the lowest decile of the income distribution receive close to 125 percent of their original income in additional transfers, while net income of households in the highest decile decreases by around 10 percent.



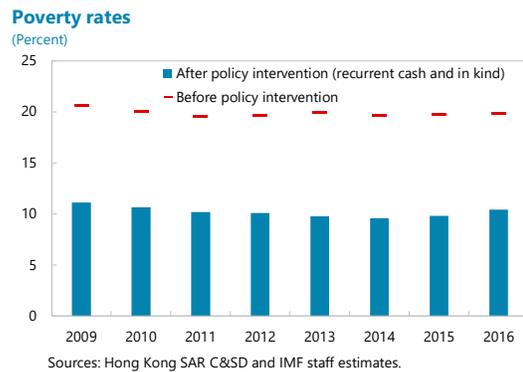
**4. ...and rising incomes have helped.** Since 2006, the average real median household income increased on average by almost 24 percent in the lowest two income deciles. That increase is almost twice as high as for the rest



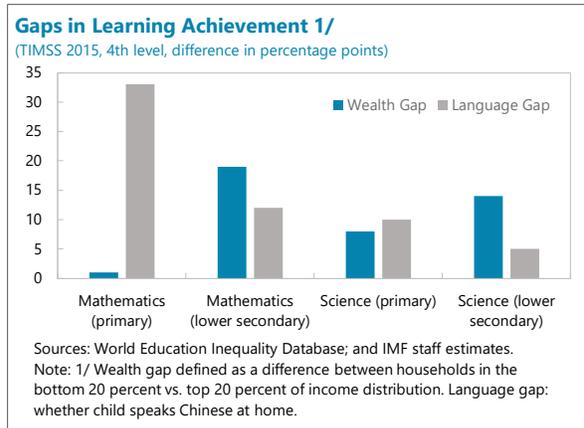
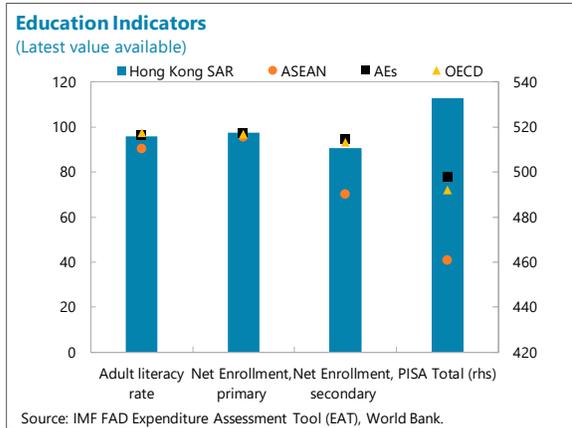
of Hong Kong SAR's population, where the cumulative real growth—while still significant—did not exceed 10 percent.



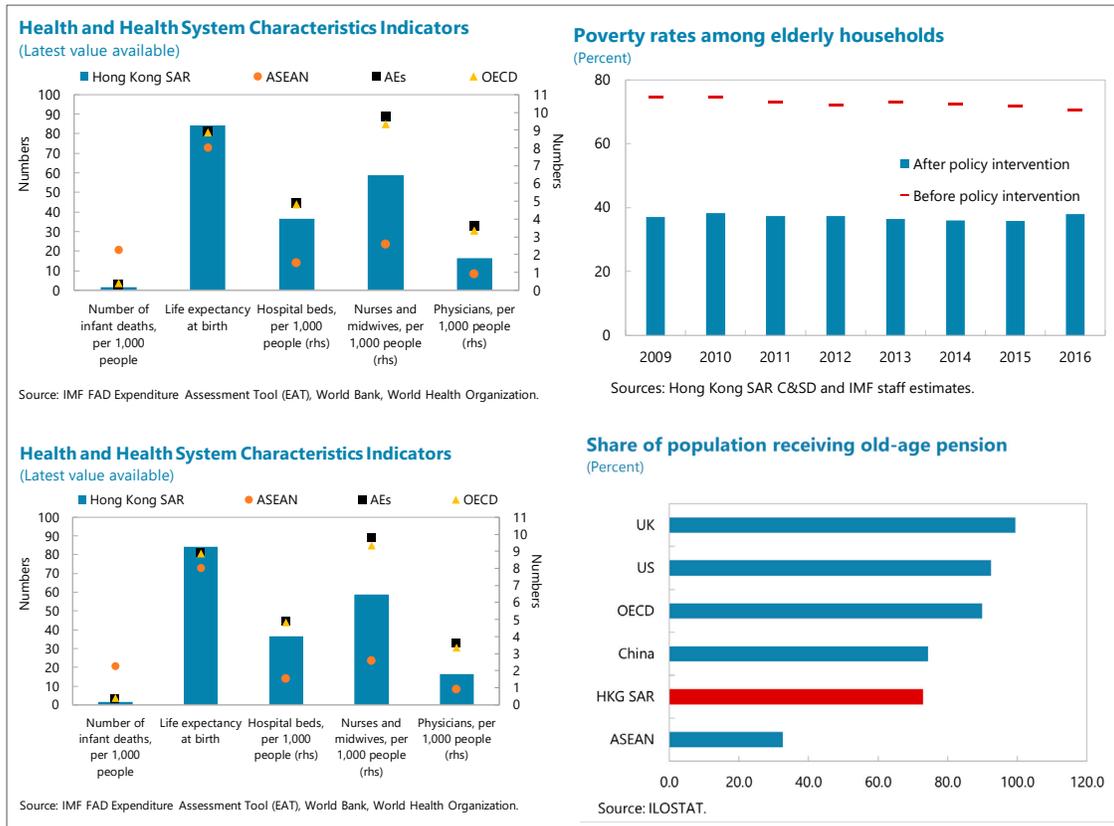
**5. ...but problems remain.** Levels of inequality in Hong Kong SAR remain high, both by historical standards and by international comparison. Over 10 percent of the population lives in poverty (with the poverty line defined as half of the median income for a given household size)—even after the policy measures—and this ratio has increased since 2014. Sharply rising house prices, which outpaced wage growth, put private housing out of reach for a significant share of the population; consequently, around 30 percent of all households live in public rental housing, where the average wait time has increased from 1.8 years for family applicants and 1.1 years for the elderly in 2008, to 5.5 years and 2.9 years, respectively, in September 2018, and additional 15 percent of households live in subsidized sale flats. The share of housing benefits going to households in the lowest income quintile has been falling while the share of government spending dedicated to housing has remained steady, at around 1.1 percent of GDP since 2005.



**6. Looking at equality of opportunities, Hong Kong SAR compares well on many of the indicators, though pockets of inequality remain.** Over 95 percent of the population have access to financial services; adult literacy rates, as well as secondary and primary school enrollment are very high and similar to other advanced economies, while on PISA scores Hong Kong SAR surpasses its peers. However, achievement differentials do exist between children based on their family's income, and between children who do and do not speak Chinese at home (with non-Chinese speaking children considered to be at a disadvantage), indicating that more resources might be needed to address these challenges.



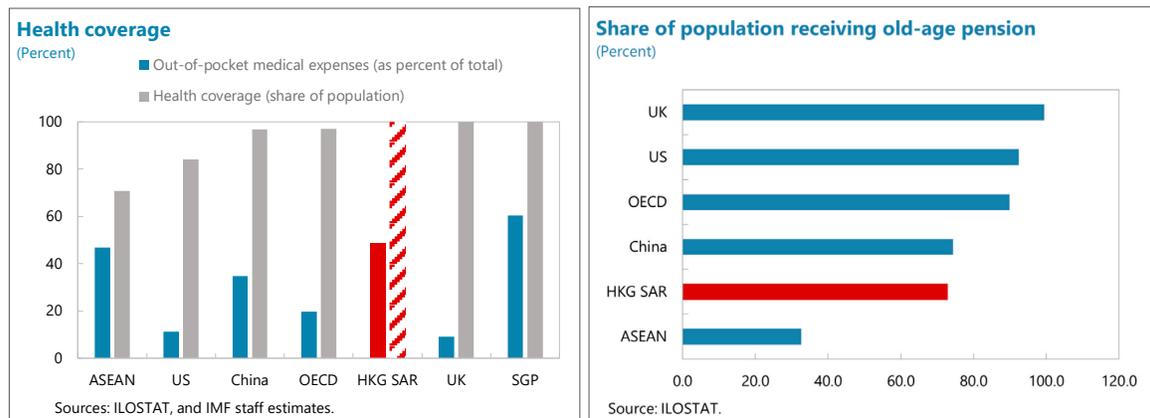
**7. Levels of pension and health coverage are also high, but there is room to increase the safety net for the elderly.** While health coverage extends to the whole population and health outcomes in Hong Kong SAR compare favorably to other advanced economies, the share of out-of-pocket medical expenses is higher than in other advanced economies. Among the elderly, the share receiving old-age pension is lower than in other advanced economies (though it is important to note that over 70 percent of Hong Kong SAR’s population aged 65 and above receive social security, and the share rises to 87 percent for those over 70) and close to 40 percent of elderly households live in poverty.



## B. Empirical Analysis

*In the years to come, aging is projected to push inequality up. More active government policies, including increased tax progressivity, higher public spending on transfers, health and social welfare, and public housing provision could reduce the Gini index by 3½ points by 2050. At the same time, growth does not need to be lower. Based on the empirical relationship between growth and inequality established in the literature, growth could be boosted by 0.2-0.5 percentage points on average per year if these active policies are implemented.*

### 8. In this section, we estimate the link between inequality and its drivers, and project such drivers to create two forward-looking scenarios for inequality in Hong Kong SAR.



Using the same setting as Jain-Chandra and others (2018) (JC et al) and extending the data to include Hong Kong SAR, we first document the main drivers of inequality in 1992–2010 splitting them into structural and policy variables. We then formulate a baseline scenario in which structural variables are projected forward and policies respond only passively. In addition, an “active policy” scenario is formulated and its impact on inequality assessed. Finally, estimates from the literature on the link between inequality and growth are used to generate a range of impacts of such “active policies” on growth.

**9. We estimate the drivers of inequality using the approach in Jain-Chandra and others, 2018.** Concretely, we estimate a fixed-effects panel regression that spans 1980–2010 and 29 economies, including Hong Kong SAR. The inclusion of Hong Kong SAR is the only difference to the analysis in JC et al.

**10. Drivers can be divided into two groups: structural factors and policies.<sup>4</sup>**

- Structural factors: (i) urbanization measured by the share of the population living in urban areas; (ii) aging as represented by the Higgins (1998) polynomial; (iii) sectoral change as measured by

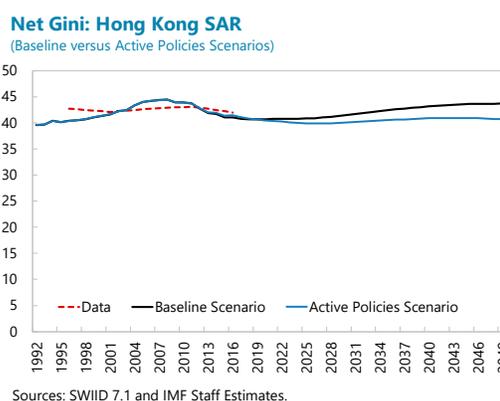
<sup>4</sup> A thorough discussion of each of these variables and the literature on their connection to inequality can be found in JC et al.

the share of employment in the services and industry sector; and (iv) educational levels measured by the share of the population with higher education.

- Policies: (i) individual income tax revenue; (ii) property tax revenue; (iii) public spending on health; (iv) public spending on social protection; and (v) overall redistribution as proxied by the difference between the Gini index before (market Gini) and after transfers and taxes (net Gini). Policies (i)-(iv) are measured as a share of GDP. The inclusion of the two types of taxes is due to their progressive nature, either relying on progressive scales (individual income tax more often than property taxes) or falling disproportionately on high-income/wealth households.

**11. Including Hong Kong SAR in the empirical analysis retains all of the main conclusions of JC et al (see Table 1).<sup>5</sup>** Given that HKSAR is an outlier in many dimensions (being a major financial center) and is often hard to treat in a panel setting, the fact that results are broadly consistent between JC et al (column 1 of Table 1) and those here (column 2 of Table 1) is reassuring. There are some differences though that are worth outlining. Estimates for structural variables are very comparable, except those pertaining to the industry share in employment which are somewhat weaker but still significant at 5 percent level and with the same sign. However, the joint impact of the two industry share variables (linear and quadratic terms) are similar across the two specifications, because both terms are smaller in absolute terms in column (2) compared to (1) while still having opposite signs. Employment in services was barely significant in (1) and is now insignificant. Results for structural variables are intuitive and consistent with the literature. Within the policy variables, the main difference is a slightly higher coefficient on individual income tax which is now marginally significant. Other policies are very comparable across columns (1) and (2). In general, higher spending on health and social protection, more redistribution and higher tax revenues on properties and individual income taxes all lower inequality as measured by the Gini after transfers and taxes.

**12. Having established an empirical link between inequality and its drivers, we project structural variables and passive policies forward to forecast inequality under a “Baseline Scenario”. Structural variables are easier to predict.** Population trends are taken from the UN’s medium-variant population projections, urbanization and sectoral variables are held constant given full urbanization and preponderance of services in Hong Kong SAR. Educational attainment is also held constant.<sup>6</sup> As for policies, two are held constant for lack of specific policy intentions in these areas (redistribution and individual income tax), but the other three are allowed to adjust passively to



<sup>5</sup> We found significant differences between SWIID based inequality data and official sourced data for HKSAR. We decided to take the latter for this study, while maintaining the dataset in JC et al for all other countries which was based on SWIID data.

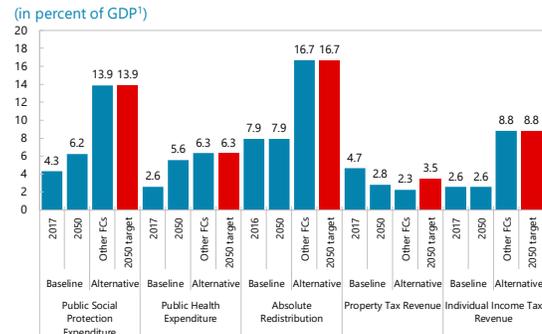
<sup>6</sup> Underlying these assumptions is the idea that education, urbanization and sectoral compositions are close to their long-run steady-state levels while ageing is not.

projected changes in conditions, most importantly demographics. For the two expenditure variables, we use the projections in Mano (2017) that build on Clements and others (2015), Clements and others (2013) and IMF (2017), and essentially assume that the demographic structure drives the path of public expenditures on health and social protection. Property tax revenues are assumed to decline to the level consistent with a zero house price gap by 2030, analogous to analysis in Mano (2017) applied to property tax revenues rather than to headline fiscal revenues.<sup>7</sup>

**13. Under the Baseline Scenario, inequality is expected to rise further.** Inequality declined by 0.7 Gini points between 1996 and 2016. Taking our baseline projections for structural variables and policies, the net Gini could rise by 2.6 points between 2016 and 2050. This underlines the challenge of tackling inequality in Hong Kong SAR. Note that inequality rises despite our assumption that public expenditure adjusts naturally to demographic trends, something that alleviates some of the inequality generated by rapid aging.

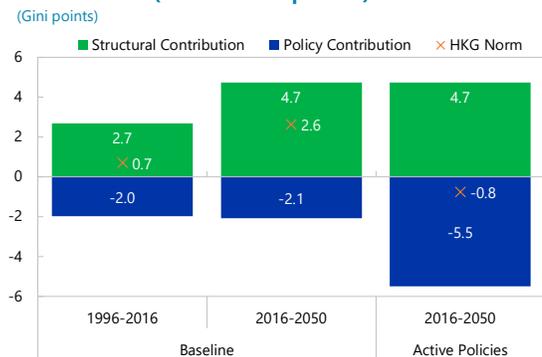
**14. An “active policies” scenario is then constructed.** In this scenario, structural variables are kept unchanged from the baseline scenario, but policies are adjusted to combat rising inequality. In particular, all policies except property tax revenue are assumed to converge to the mean of those in other financial centers<sup>8</sup> by 2050. This would entail a rise of 7.7 percentage points of GDP in public social expenditure, of 0.7 percentage points of GDP in public health expenditure, of 8.8 points in the coefficient of absolute redistribution, and of 6.2 percentage points of GDP of individual income tax revenue. For property tax revenue, Hong Kong SAR’s revenues under the baseline are projected to be higher than the current average of other financial centers, this despite the projected decline due to the normalization of the housing cycle. Because of its economic structure, Hong Kong SAR is likely to continue to rely on property taxation over the long run and thus the active policies scenario assumes that recurrent property taxes are raised to partially

**Baseline and Alternative Scenarios**



Sources: IMF Staff Estimates.  
Note: Except for absolute redistribution.

**Contributions (with baseline policies)**



Sources: IMF Staff Estimates.

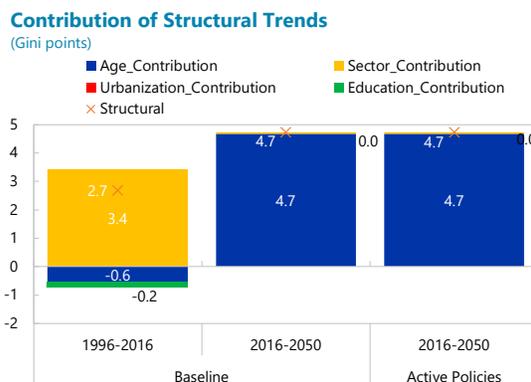
<sup>7</sup> This is done by estimating the historical relationship between the IMF team’s estimates of the house price gap (which is an average over 5 different approaches) and property tax revenues between FY95/96 and FY17/18. Such an analysis finds that the tax revenues in FY17/18 of 4.7 percent of GDP were almost 2 percentage points higher than the level consistent with a zero house price gap (or the full period average since full-sample estimates of house price gaps are around zero).

<sup>8</sup> These include Belgium, Ireland, Luxembourg, Netherlands, Singapore, and Switzerland.

offset the loss of revenue with the eventual removal of stamp duties in the housing market as the house price gap closes.<sup>9</sup>

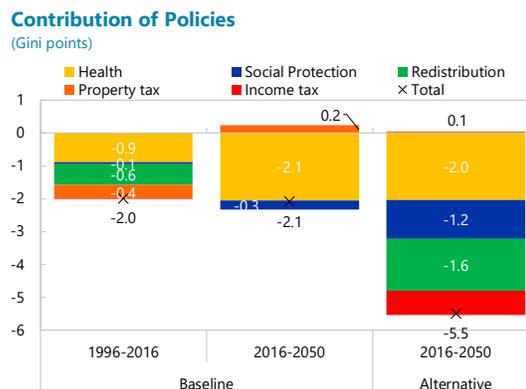
**15. Under “active policies”, inequality declines by 0.8 points from its 2016 level.** The active policies package prevents inequality from rising 2.6 points, and thus its effect is to lower Hong Kong SAR’s net Gini by 3.4 points by 2050 relative to the baseline. It is instructive to decompose the changes in net Gini in both baseline and active policies scenarios.

**16. Structural factors have contributed to a rise in inequality and are expected to continue to pose a challenge, particularly aging.** In the past, the move from industry to services created some inequality and aging was not a major factor as the demographic transition was still in its inception. However, Hong Kong SAR’s population is expected to age quickly in the medium-term and this is by far the largest challenge to inequality, possibly pushing the net Gini index higher by close to 5 points by 2050.



Sources: IMF Staff Estimates.

**17. Policies have been supportive in the past, but if not adjusted, will lose some of their redistributive power.** In the past, larger redistribution and property taxes have been successful in containing increases in inequality due to structural change. But going forward, under the baseline scenario, policies will not be able to further contain rising inequality due to aging. Health expenditure is assumed to increase in line with changing demographics and thus it is not surprising that it is the one policy that seems most effective under the baseline.



Sources: IMF Staff Estimates.

**18. Under the active policies scenario, all policies make a significant contribution to reducing inequality.** After the needed rise in health expenditure, the largest impact is due to higher overall redistribution, whose contribution to lowering inequality is 1.6 Gini points compared to the baseline. This variable is a summary statistic of all efforts to contain market-generated inequality and is shown to be crucial in preventing the rise of inequality in the baseline. It would include all efforts mentioned below plus those to expand public housing supply among others. Public social protection expenditure comes second contributing 0.9 points to lowering the Gini compared to

<sup>9</sup> The assumed level of property tax revenue to GDP in 2050 (3.5 percent) is still lower than its current level (4.7 percent), but higher than the current average of financial centers or its “natural” level if the house price gap closes (2.3 and 2.8, respectively).

baseline. This would entail strengthening programs, like Working Family Allowance, Old Age Living Allowance, child care policies and boosting public education. Higher and more progressive individual income taxes would contribute another 0.7 points. Property taxes which were declining significantly under the baseline, contribute to lowering the Gini index by 0.1 points compared to baseline with a switch to higher reliance on recurrent property taxes which are less dependent on the housing cycle. Health expenditure is not much changed between baseline and active policies scenarios reflecting the strong increase that it is already embedded in the baseline.

**19. Thus, active policies generate a decline of the net Gini of 3.4 points. But what about the impact on growth?**

**20. Although the early literature found a positive relationship between initial inequality and subsequent growth, several recent studies found the opposite.** Two papers utilized the Deininger and Squire Database, 1996, where income inequality is measured by the Gini index after transfers and taxes. Barro (1999) found that the effect of inequality on growth was negative for per capita GDP below around \$5000 (in 1985 USD) and positive above, implying that increases in income inequality negatively affect growth in poor countries, and positively in rich countries.<sup>10</sup> Forbes (2000) found a significant positive link between inequality and growth in the short- and medium-term. More recently, however, several studies have found a negative relationship between inequality and growth (Castello-Climent (2007), Cingano (2014), Ostry et al (2014), and Dabla-Norris and others (2015)). Table 2 summarizes these results, focusing on estimates of how the Gini index affects growth.

**21. There are various channels through which higher inequality could lead to lower growth.**

- *Human capital*: income disparities limit the ability of poor households to stay healthy and accumulate human capital. (Perotti, 1996; Galor and Moav, 2004; Aghion, Caroli, and Garcia-Penalosa, 1999);
- *Credit market imperfections*: lower-income households are unable to make long-term investments, such as in human capital, due to limited access to credit (Galor and Zeira, 1993);
- *Fertility*: lower-income households tend to have a higher number of children, and invest less in each of them, which leads to lower average human capital (De la Croix and Doepke, 2003; Moav, 2005);

<sup>10</sup> Refers to growth rate regression with fertility variable omitted (Table 4 in Barro, 1999).

- *Public Policy Choices*: higher inequality may lead to voter backlash against economic liberalization, and create protectionist pressures for policymakers (Claessens and Perotti, 2007)<sup>11</sup>;
- *Socio-political unrest*: increased inequality can lead to higher political and economic instability (Alesina and Perotti, 1996);
- *Aggregate Demand*: concentration of income can depress aggregate demand and lower growth given higher propensity to save of richer households (Carvalho and Rezai, 2015)

**22. Reducing income inequality could raise growth in the medium term.** Applying the literature's more recent estimates, the reduction of 3.4 points in the net Gini envisioned in the active policies scenario could result in higher growth of real per capita GDP by 0.2 to 0.5 percentage points per year compared to the baseline scenario. Given that Hong Kong SAR is an advanced economy, its growth rate is expected to stay in lower single digits, and fall over the medium-term due to aging, this would be a significant boost to the city's potential.

## C. Policy Recommendations

*More active fiscal policies could be used to lower income inequality without sacrificing medium-term growth prospects.*

**23. Hong Kong SAR's tax system could be made more progressive.** To that end, the authorities could increase progressivity of the salaries tax, especially at the top, and reverse the recent tax cuts. Recurrent property taxes—general rates and government rent—could be raised. That would lower the reliance on volatile transaction taxes, making the revenue source more immune to the housing cycle. The recurrent property tax schedule could also be made more progressive, with higher taxes levies on high-value properties.

**24. Public spending in several areas could be raised to help stem inequality increases.**

- Public spending on social welfare could continue to be raised to boost redistribution and increase access of poorer households.
- Given the impending aging problem, public health expenditure will need to go hand in hand with the pace of aging, resulting in a considerable expansion of more than a third by between FY2017/18 and 2030, and doubling by 2050.
- Public social protection expenditure will also need to be expanded, including the Old Age Living Allowance (OALA) and the Working Family Allowance, while targeting could be improved by

---

<sup>11</sup> Another older strand of the literature asserts that higher inequality may prompt voters to demand higher taxation and regulation, higher public expenditure programs and transfer payments, which in turn could lower investment and reduce economic efficiency (Bertola, 1993; Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Benabou, 1996; Perotti, 1996) but empirical evidence is weak as recent studies have shown (Ostry, 2014, Cingano, 2014).

phasing out Old Age Allowance that is not means-tested in favor of OALA or other means-tested programs.

- Public housing expenditure should be expanded to help alleviate the acute housing shortage and shorten the average waiting time for public rental housing.
- The offsetting mechanism in the Mandatory Provident Fund should be abolished, in line with the authorities' intentions.
- Spending on education and child care should be raised to help lower the market income inequality directly. The commissioned study aiming to determine the demand and supply for child care services and map out the long-term service development programs, as well as the initiatives mentioned in the 2018 Policy Address, should help in this regard.
- The level of *statutory minimum wage* should be revised regularly to keep in line with rising cost of living. The authorities could consider moving to annual from the current biennial reviews if deemed necessary at any stage.

**Table 1. Hong Kong SAR: Panel Regression Estimates of the Drivers of Inequality**

Dependent variable: Net Gini Coefficient		JC et al	Adding HKSAR
		(1)	(2)
Structural Variables	Share of Employment in Services	-0.320+ (-1.91)	-0.108 (-0.65)
	Share of Employment in Services Squared	0.002 (1.30)	0.000 (0.12)
	Share of Employment in Industry	-0.886** (-4.11)	-0.444* (-2.23)
	Share of Employment in Industry Squared	0.010** (2.64)	0.002 (0.63)
	Age Distribution D1 <sup>1</sup>	66.942** (7.22)	54.739** (6.09)
	Age Distribution D2 <sup>1</sup>	-8.758** (-7.12)	-7.219** (-6.05)
	Age Distribution D3 <sup>1</sup>	0.338** (7.02)	0.278** (5.94)
	Share of Population living in Urban Areas	1.576** (12.60)	1.458** (11.73)
	Share of Population living in Urban Areas Squared	-0.011** (-11.94)	-0.010** (-10.85)
	Share of Population with Some Tertiary Education	-0.160* (-2.29)	-0.192** (-2.77)
	Share of Population with Some Tertiary Education Squared	0.004** (3.69)	0.005** (4.44)
	Policy Variables	Public Social Protection Expenditure as Share of GDP	-0.146** (-3.92)
Public Health Expenditure as Share of GDP		-2.314** (-5.67)	-2.253** (-5.57)
Public Health Expenditure as Share of GDP Squared		0.183** (5.60)	0.190** (5.86)
Absolute Redistribution		-0.138** (-3.60)	-0.141** (-3.64)
Propert Tax Revenue as Share of GDP		-0.241 (-1.22)	-0.258 (-1.36)
Individual Income Tax Revenue as Share of GDP		-0.065 (-0.90)	-0.121+ (-1.68)
Number of Observations		573	588
Adjusted R-squared		0.968	0.967
Country Fixed Effects		Yes	Yes
Year Fixed Effects		No	No

t statistics in parentheses

+ p&lt;0.10, \* p&lt;0.05, \*\* p&lt;0.01

**Table 2. Hong Kong SAR: Summary Results from Literature on Growth and Inequality**

Source	Measure of inequality	Marginal impact of 1 additional Gini point on average annual real GDP per capita	Controls for redistribution?
Dabla-Norris and others, 2015	Net Gini index	-0.067*	No
Ostry et al, 2014	Net Gini index	-0.144***	Yes
Cingano, 2014	Net Gini index	-0.155**	No
Castello-Climent, 2010	Income Gini Coefficient	-0.053*	No
Forbes, 2000	Gini Coefficient	0.13**	No
Barro, 1999	Gini Coefficient	0.06	No

\*, \*\*, and \*\*\* indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

## References

- Aghion, P., E. Caroli, and C. Garcia-Penalosa, 1999, "Inequality and Economic Growth: The Perspective of the New Growth Theories," *Journal of Economic Literature*, Vol. 37(4), pp. 1615–60.
- Alesina, A., and R. Perotti, 1996, "Income Distribution, Political Instability and Investment," *European Economic Review*, Vol. 40(6), pp. 1203–28.
- Alesina, A., and D. Rodrik, 1994, "Distributive Politics and Economic Growth," *Quarterly Journal of Economics*, Vol. 109(2), pp. 465–90.
- Barro, R.J., 2000, "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth*, Vol. 5(1), pp. 5–32.
- Bénabou, R., 1996, "Inequality and growth" *NBER Working Paper n° 5658*, July.
- Bertola, G., 1993, "Factor shares and savings in endogenous growth," *American Economic Review*, 83(5):1184-1198.
- Carvalho, L., & Rezai, A., 2015, "Personal income inequality and aggregate demand," *Cambridge Journal of Economics*, 40(2), 491-505.
- Castello-Climent, 2007, "Inequality and Growth in Advanced Economies: An Empirical Investigation," *Institute of International Economics*, University of Valencia.
- Cingano, F., 2014, "Trends in Income Inequality and its Impact on Economic Growth", *OECD Social, Employment and Migration Working Papers*, No. 163, OECD Publishing.
- Claessens, S., & Perotti, E. C., 2007, "Finance and Inequality: Channels and Evidence," *Journal of Comparative Economics*, 35 (4): 748-73.
- Clements, B., D. Coady, F. Eich, and S. Gupta, A. Kangur, B. Shang and M. Soto, 2014, "Equitable and Sustainable Pensions: Challenges and Experience."
- Clements, B., D. Coady, F. Eich, and S. Gupta, A. Kangur, B. Shang and M. Soto, 2013, "The Challenge of Public Pension Reform in Advanced and Emerging Economies", *IMF Working Occasional Paper* No. 275.
- Clements, B., K. Dybczak, V. Gaspar, S. Gupta, and M. Soto, 2015, "The Fiscal Consequences of Shrinking Populations," *IMF Staff Discussion Note*, SDN/15/21.
- De la Croix, D., and M. Doepke, 2003, "Inequality and Growth: Why Differential Fertility Matters," *American Economic Review*, 93(4), 1091-113.

E. Dabla-Norris, K. Kochhar, N. Suphaphiphat, F. Ricka, E. Tsounta, 2015, "Causes and Consequences of Income Inequality: A Global Perspective," *IMF Staff Discussion Note*, SDN/15/13.

Forbes, K.J., 2000, "A Reassessment of the Relationship between Inequality and Growth," *American Economic Review*, Vol. 90(4), pp. 869–87.

Galor, O. and J. Zeira, 1993, "Income Distribution and Macroeconomics," *Review of Economic Studies*, 60, 35–52.

Galor, O., and O. Moav, 2004, "From Physical to Human Capital Accumulation: Inequality and the Process of Development," *Review of Economic Studies*, Vol. 71(4), pp. 1001–26.

Hong Kong SAR Government, 2016, "Hong Kong 2016 Population By-census - Thematic Report: Household Income Distribution in Hong Kong".

Hong Kong SAR Government, 2017, "The Gini Coefficients of Hong Kong in 2016: Trends and Interpretations", Half-yearly Economic Report.

IMF, 2017, "Fiscal monitor"

Jain-Chandra, S., N. Khor, R. Mano, J. Schauer, P. Wingender and J. Zhuang, 2018, "Inequality in China - Trends, Drivers and Policy Remedies," *IMF Working Paper* 18/127.

Mano, R.C., 2017, "Medium-term fiscal prospects and implications" in *People's Republic of China-Hong Kong Special Administrative Region: Selected Issues*

Moav, O., 2005, "Cheap Children and the Persistence of Poverty", *Economic Journal*, 115, 88-110.

Ostry, J., A. Berg, C. Tsangarides, 2014, "Redistribution, Inequality, and Growth," *IMF Staff Discussion Note*, SDN/14/02.

Perotti, R., 1996, "Growth, Income Distribution, and Democracy: What the Data Say," *Journal of Economic Growth*, Vol. 1(2), pp. 149–87.

Persson, T., and G. Tabellini, 1994, "Is Inequality Harmful for Growth?" *The American Economic Review*, Vol. 84(3), pp. 600–21.

Solt, Frederick, 2016, "The Standardized World Income Inequality Database," *Social Science Quarterly* 97(5):1267-12

# FINANCIAL CONDITIONS AND GROWTH-AT-RISK IN HONG KONG SAR<sup>1</sup>

*As a small, open economy and a regional financial center, Hong Kong SAR's financial conditions are affected by domestic and external developments and can exert a sizable impact on growth. Financial conditions indicators are useful in detecting financial vulnerabilities and can serve as a predictor of downside risks to growth. Using a country-specific Financial Conditions Index for Hong Kong SAR, we find that asset market valuations play an important role in determining its financial conditions. While near-term risks to growth are limited, easy financing conditions pose downside risks to medium-term growth. Moreover, a sizable correction to equity and property markets could have a large negative impact on near-term growth.*

**1. Financial conditions refer to the ease with which households and corporates access funding.** To measure funding conditions, including the costs of credit as well as the terms and conditions borrowers face, financial condition indexes (FCI) include information on the price of risks, credit aggregates and external conditions. Using methodologies introduced in the IMF GFSR (2017b), the FCI for Hong Kong SAR is estimated using principal component analysis (PCA) and incorporates information from 17 variables.<sup>2</sup> FCI variables are grouped into separate (i.e. “partitioned”) categories to help better assess different financial conditions.

**Table 1. Hong Kong SAR: Underlying FCI Variables by Category**

<b>Price-based indicators (Price of risk)</b>	<b>Property indicators</b>	<b>Equity indicators</b>	<b>Leverage-based indicators</b>	<b>FX</b>
3-month Hibor change, yoy, bps	Residential property price index, log diff.	Equity market capitalization, log diff.	HKD domestic credit, log diff.	HKD REER, Log diff
3-month Hibor-Libor spread, bps	Office space price index, log diff.	Hang Seng Index (HSI), log diff.	HK credit gap (HKMA measure), level diff.	
3-month Hibor-3-month EFB spread, bps		Realized HSI volatility, log diff	Household loans, log diff.	
2-year EFN - 3 month EFB spread, bps			Household loans/bank asset, level diff.	
			Property-related loans, log diff.	
			Property-related loans/bank asset, level diff.	
			Outstanding HKD debt instruments, excluding EFBN, log diff.	

Source: Bloomberg, CEIC, HKMA, IMF staff estimates

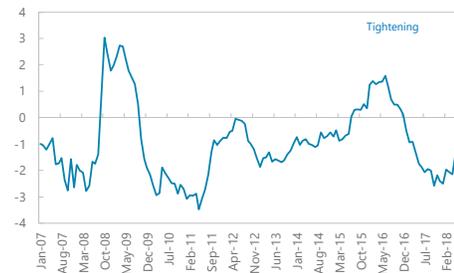
<sup>1</sup> Prepared by Sally Chen and Sheheryar Malik. We thank Romain Lafarguette, Alan Feng and Prasad Ananthakrishnan for their thoughtful comments and suggestions.

<sup>2</sup> The FCI is normalized to have a zero mean over the estimated period of January 1995 to June 2018.

For example, given concerns regarding housing market overvaluation and to better understand the role asset prices play in Hong Kong SAR's financial conditions, property and equity market indicators are grouped together to summarize asset price valuations. Other variables, such as price-based indicators, are grouped separately to measure the cost of borrowing.

**2. While financial conditions in Hong Kong SAR remain accommodative, the degree of accommodation is declining.** Since the end of 2017, interest rates, reflecting rising rates in the U.S., have increased. These developments, combined with sizable equity market losses have contributed to a tightening of financial conditions in Hong Kong SAR.

Hong Kong SAR Financial Conditions Index

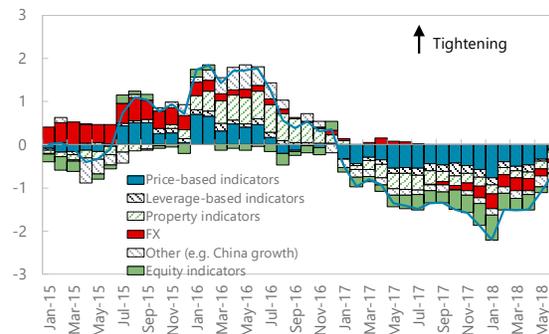


Sources: Bloomberg LP, CEIC and IMF Staff Estimates.

**3. Financial conditions in Hong Kong SAR are highly correlated with external conditions, reflecting its role as a financial center.** Not surprisingly, given the presence of international banks and Hong Kong SAR's role as a trade intermediary, including as a gateway to Mainland China, global risk sentiment affects local market volatility. Financial conditions have been mostly accommodative since the Great Financial Crisis. However, increased volatility and uncertainty during the European sovereign debt crisis in late 2011 as well as changes to the RMB fixing mechanism in 2015 tightened financial conditions in Hong Kong SAR.

**4. Asset market performance – changes in property and equity market valuations in particular – plays a large role in the swings in Hong Kong SAR's FCI.** On average, property market valuation explains 27 percent of FCI movements in 2016-2018. Equity valuation and volatility captured another 13 percent. Price-based indicators, a proxy for funding costs, captured roughly 25 percent while leverage, proxied by credit supplied, played a relatively limited role, at 13 percent over the same period. Gains in property and equity markets as well as low borrowing costs in 2017 helped to ease overall financial conditions. However, recent losses in equities, combined with rising rates and reduced credit growth in the economy, have moved overall financial conditions closer towards neutral.

Underlying FCI Variables by Category



Source: Bloomberg, CEIC, Staff estimates

**5. Quantile regressions, based on the partitioned FCI components, offer insights into the impact of financial conditions on growth and underscore the large role asset prices play in Hong Kong SAR's financial conditions.** These regressions show that different aspects of financial conditions – risks or asset valuations, for example – exert varying degrees of impact on growth and their impacts vary across different growth quantiles (Figure 1, Annex tables 1 & 2 and Technical

Appendix). For example, while a one-unit increase<sup>3</sup> in the price of risk is associated with declines in growth rates in the near term,<sup>4</sup> higher risk prices have bigger impacts when growth rates are low (e.g. below the 50<sup>th</sup> percentile). Specifically, increases in the price of risks, such as higher funding costs or wider yield spreads by one standard deviation, for example, have limited impact on growth when growth rate is at the 90<sup>th</sup> percentile, but could slow growth by as much as 0.8 percentage points when growth rates are at the 25<sup>th</sup> or 10<sup>th</sup> percentile. By contrast, over the same horizon, increases in property market values are particularly supportive during low growth periods but have relatively muted impact when growth is high (e.g. above the 50<sup>th</sup> percentile). Meanwhile, while leverage and property prices tend to be positively correlated, increases in leverage are supportive of growth only in high-growth scenarios, as noted earlier, while property price increases provide bigger boosts to growth at lower growth levels. This divergence is likely related to the fact that house prices in Hong Kong SAR are relatively more detached from leverage (HKMA Quarterly Bulletin 2002).

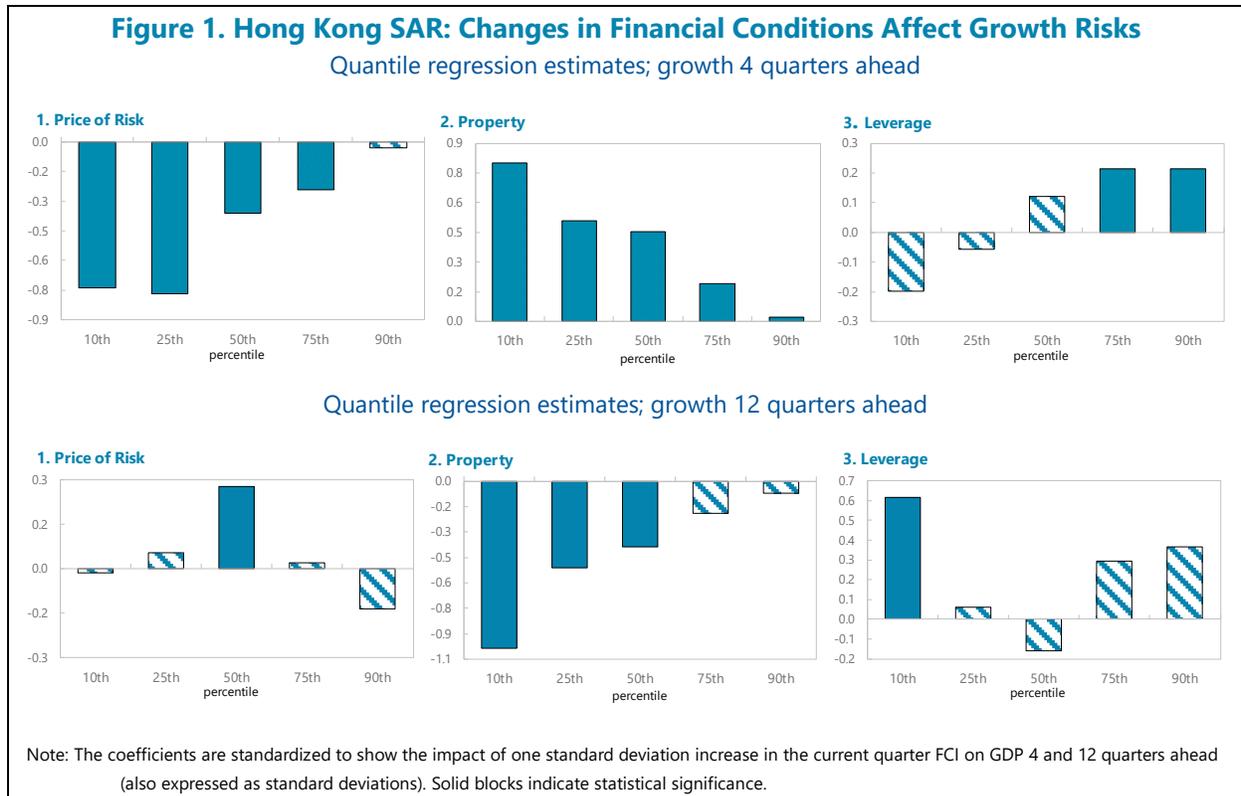
**6. Interestingly, while increases in leverage are generally correlated with higher growth, leverage can also detract from growth.** An increase in leverage is associated with reduced growth at lower growth quantiles in the near term (though the results are not conclusive). This finding, taken together with insights from the impact of higher risk prices on growth distribution, suggests a negative feedback loop between higher debt, higher funding costs and growth. In particular, rising debt service payments, combined with a growing debt load, is particularly pernicious during low-growth periods, and could amplify the negative feedback loop between debt service capacity and investment and consumption.

**7. Over the medium term, easier financing conditions tend to be associated with weaker growth, underscoring their risks to longer-term growth.** Notably, property price gains are associated with lower growth over the medium term, in contrast to the boost these increases provide over the near term. Reflecting the large role asset prices play in Hong Kong SAR's financial conditions, changes in property prices generally have larger impacts on growth relative to price and leverage, particularly at lower growth quantiles. This suggests that property prices can be a powerful amplifier of risks during lower-growth periods, providing sizable boosts to growth during upturns but also considerable drags during downturns.

---

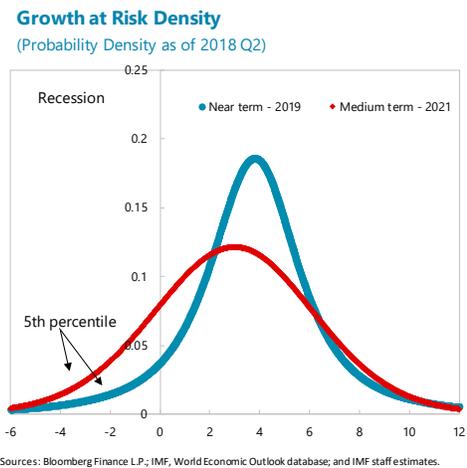
<sup>3</sup> Units are measured in standard deviations to standardize measures across different variables.

<sup>4</sup> Near term refers to the 1-year horizon; medium term refers to the 3-year horizon.



**8. Given current financial conditions, the Growth-at-Risk analysis suggests a low probability of recession in the near and medium term.** Financial conditions are currently still easy and are moving towards neutral. The distribution of risks to growth is thus largely stable over the next three years. The forecasted probability of a recession over the next year was around 10 percent, not much different from 2017. Over the medium term out to 2020, recession risks edge higher to about 18 percent. Using quantile regressions, the 5th percentile in the near term is -2.12 percent, and medium term is -3.36 percent.<sup>5</sup>

**9. The large role asset valuations play in Hong Kong SAR’s financial conditions suggests that their correction – with some already underway – could negatively affect financial conditions and output growth.** These potential changes in financial conditions matter as they can amplify adverse shocks to the economy through financial frictions. Buoyant asset markets lift risk appetite, encourage investment and reduce funding costs. However, as these conditions deteriorate, they can



<sup>5</sup> The estimation of conditional quantiles for growth forecasts is based on Adrian et al (forthcoming) and IMF (2017). The estimation of t-skew distribution parameters is based on Singer and Nelder (2009) which provides the basis from which to calculate the associated growth at risk (GaR).

introduce sizable downside risks. Tighter financial conditions have historically been associated with a decline in output growth. As seen in the results from the quantile regression discussed above, higher funding costs, lower credit supplied and reduced wealth effects from lower asset prices could weigh on growth, introducing a negative feedback loop between tightening financial conditions and weakening consumption and investment. There is also a trade-off between growth over the near term and the medium term as suggested by the quantile regressions: to the extent that near-term growth slows due to tightened financial conditions, risks to medium-term growth is lower by comparison.

## References

Adrian, T., N. Boyarchenko, and D. Giannone, "Vulnerable Growth", *American Economic Review*, forthcoming.

He, X. and L. Zhu, 2003, "A Lack-of-fit Test for Quantile Regression", *Journal of the American Statistical Association* 98, no. 464: 1013-1022.

Hong Kong Monetary Authority (2002) *Quarterly Bulletin*, August 2002.

International Monetary Fund, 2017a, "Are Countries Losing Control of Domestic Financial Conditions?", *Global Financial Stability Report April 2017*, Chapter 3, Washington DC.

International Monetary Fund, 2017b, "Financial Conditions and Growth at Risk", *Global Financial Stability Report October 2017*, Chapter 3, Washington DC.

International Monetary Fund, 2018, "A Bumpy Road Ahead", *Global Financial Stability Report April 2018*, Chapter 1, Washington DC.

Koenker, R. and Machado, J.A., 1999. "Goodness of Fit and Related Inference Processes for Quantile Regression", *Journal of the American Statistical Association*, 94(448), pp.1296-1310.

Singer, S. and Nelder, J., 2009. "Nelder-mead algorithm", *Scholarpedia*, 4(7), p.2928.

## Appendix I. Estimation of the Conditional Quantiles

For the horizon  $h \in \{4, 12\}$ , where  $h$  represents the quarters ahead, quantile regressions of the dependent GDP growth variables  $y_{t+h}$  are estimated conditional on macro-financial variables  $X_{i,t}$ ,  $Q(y_{t+h}, \tau | \{X_{i,t}\}_{i \in P})$ , for a given date  $t$ , based on the point estimates of the coefficients  $\hat{\alpha}^\tau$  and  $\hat{\beta}_i^\tau$ :

$$Q(y_{t+h}, \tau | \{X_{i,t}\}_{i \in P}) = \hat{\alpha}^\tau + \sum_{i \in P} \hat{\beta}_i^\tau X_{i,t}$$

Where  $y_{t+h}$  represents future growth  $h$  quarters ahead,  $X_{i,t}$  is the partition  $i$  (for instance price, property or leverage),  $\beta_i^\tau$  is the coefficient of the  $\tau$  quantile regression,  $\alpha^\tau$  is the associated constant and  $\varepsilon_{i,t}^\tau$  the residual. The quantile regressions are estimated at different points of the distribution of  $y_{t+h}$ ,  $\tau \in \{0.1, 0.25, 0.5, 0.75, 0.9\}$ . Each beta coefficients represents the macrofinancial linkage between the variable  $X_{i,t}$  and future growth, at different points of the distribution of GDP growth (basically, the business cycle).

Using quantile regressions for estimating the conditional distribution has many advantages: first, under standard assumptions, quantile regressions provides the best unbiased linear estimator for the conditional quantile; second, quantile regressions are robust to outliers. Finally, the asymptotic properties of the quantile regression estimator are well-known and easy to derive.

For a more detailed discussion, please refer to Adrian et al.

**Appendix Table I. Quantile Regressions Results 4 Quarters Ahead**

	Quantile	Estimates (standardized)	Standard Error	95% Confidence Limits		P-Value
(intercept)	0.1	-1.07	0.26	-1.33	-0.81	0.00
Price	0.1	-0.74	0.25	-0.98	-0.49	0.00
Property	0.1	0.80	0.36	0.44	1.16	0.00
Equity	0.1	-0.58	0.37	-0.95	-0.21	0.01
Leverage	0.1	-0.20	0.43	-0.63	0.23	0.44
REER	0.1	0.20	0.34	-0.14	0.53	0.33
Real GDP CHN (yoy growth)	0.1	0.06	0.30	-0.24	0.36	0.73
(intercept)	0.25	-0.56	0.17	-0.73	-0.39	0.00
Price	0.25	-0.77	0.20	-0.97	-0.57	0.00
Property	0.25	0.51	0.24	0.27	0.74	0.00
Equity	0.25	-0.24	0.23	-0.47	-0.01	0.09
Leverage	0.25	-0.06	0.28	-0.34	0.23	0.73
REER	0.25	0.14	0.23	-0.09	0.38	0.32
Real GDP CHN (yoy growth)	0.25	0.28	0.22	0.06	0.50	0.03
(intercept)	0.5	0.12	0.12	0.00	0.23	0.10
Price	0.5	-0.36	0.17	-0.53	-0.19	0.00
Property	0.5	0.45	0.16	0.30	0.61	0.00
Equity	0.5	-0.10	0.17	-0.28	0.07	0.33
Leverage	0.5	0.12	0.19	-0.07	0.32	0.30
REER	0.5	-0.15	0.16	-0.31	0.00	0.11
Real GDP CHN (yoy growth)	0.5	0.24	0.16	0.07	0.40	0.02
(intercept)	0.75	0.43	0.13	0.30	0.56	0.00
Price	0.75	-0.24	0.17	-0.41	-0.07	0.02
Property	0.75	0.19	0.17	0.02	0.36	0.07
Equity	0.75	0.00	0.18	-0.18	0.18	0.99
Leverage	0.75	0.21	0.22	0.00	0.43	0.10
REER	0.75	-0.28	0.18	-0.46	-0.10	0.01
Real GDP CHN (yoy growth)	0.75	0.22	0.20	0.03	0.42	0.06
(intercept)	0.9	0.96	0.18	0.78	1.14	0.00
Price	1.9	-0.03	0.27	-0.30	0.24	0.85
Property	2.9	0.02	0.29	-0.27	0.31	0.92
Equity	3.9	0.27	0.31	-0.04	0.58	0.15
Leverage	4.9	0.22	0.33	-0.11	0.54	0.28
REER	5.9	-0.51	0.28	-0.79	-0.23	0.00
Real GDP CHN (yoy growth)	6.9	0.17	0.28	-0.11	0.44	0.32

**Appendix Table II. Quantile Regressions Results – 12 Quarters Ahead**

	Quantile	Estimates (standardized)	Standard Error	95% Confidence Limits		P-Value
(intercept)	0.1	-1.19	0.26	-1.45	-0.93	0.00
Price	0.1	-0.01	0.22	-0.24	0.21	0.92
Property	0.1	-0.98	0.41	-1.40	-0.57	0.00
Equity	0.1	0.42	0.24	0.18	0.66	0.00
Leverage	0.1	0.62	0.29	0.32	0.91	0.00
REER	0.1	-0.53	0.34	-0.87	-0.19	0.01
Real GDP CHN (yoy growth)	0.1	-0.53	0.31	-0.84	-0.22	0.01
(intercept)	0.25	-0.57	0.20	-0.76	-0.37	0.00
Price	0.25	0.05	0.27	-0.21	0.32	0.74
Property	0.25	-0.51	0.26	-0.77	-0.25	0.00
Equity	0.25	0.12	0.30	-0.19	0.42	0.53
Leverage	0.25	0.06	0.26	-0.20	0.33	0.69
REER	0.25	-0.15	0.29	-0.44	0.14	0.40
Real GDP CHN (yoy growth)	0.25	-0.46	0.28	-0.74	-0.18	0.01
(intercept)	0.5	-0.03	0.17	-0.20	0.14	0.78
Price	0.5	0.28	0.26	0.02	0.53	0.08
Property	0.5	-0.39	0.23	-0.61	-0.16	0.01
Equity	0.5	0.04	0.26	-0.22	0.30	0.80
Leverage	0.5	-0.16	0.29	-0.44	0.13	0.36
REER	0.5	-0.15	0.23	-0.38	0.07	0.26
Real GDP CHN (yoy growth)	0.5	-0.18	0.23	-0.42	0.05	0.20
(intercept)	0.75	0.67	0.20	0.47	0.88	0.00
Price	0.75	0.02	0.35	-0.33	0.37	0.92
Property	0.75	-0.19	0.30	-0.49	0.11	0.29
Equity	0.75	0.31	0.31	0.01	0.62	0.09
Leverage	0.75	0.30	0.42	-0.12	0.72	0.25
REER	0.75	-0.29	0.26	-0.55	-0.03	0.07
Real GDP CHN (yoy growth)	0.75	0.22	0.31	-0.09	0.52	0.24
(intercept)	0.9	0.95	0.20	0.75	1.15	0.00
Price	0.9	-0.13	0.44	-0.57	0.30	0.61
Property	0.9	-0.07	0.31	-0.38	0.24	0.71
Equity	0.9	0.11	0.30	-0.18	0.41	0.53
Leverage	0.9	0.37	0.46	-0.09	0.82	0.18
REER	0.9	-0.15	0.26	-0.41	0.11	0.35
Real GDP CHN (yoy growth)	0.9	0.27	0.23	0.04	0.50	0.05

## POSSIBLE SPILLOVERS FROM INTERNATIONAL TAX REFORMS<sup>1</sup>

Recent international tax reforms, in particular the major reform undertaken in the United States in 2018, are likely to have spillovers on other economies, including Hong Kong SAR. While Hong Kong SAR's corporate income tax system remains competitive in absolute terms, tax cuts elsewhere may make it relatively less attractive as a place for investing and reporting profits. The resulting medium-term revenue loss is estimated at roughly 5 percent of corporate income tax revenues at the current rate of 16.5 percent. If the corporate income tax rate were to be reduced, revenue losses would be higher.

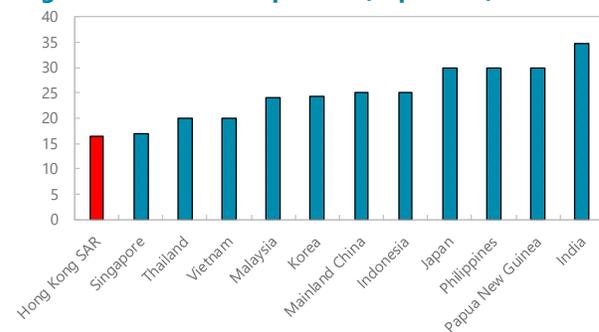
### A. The 2018 U.S. Tax Reform and Other Recent Reforms

**1. The recent U.S. tax reform reduced the corporate income tax (CIT) rate by 14 percentage points.** As a result, the combined (state and federal) CIT fell from around 40—one of the highest rates globally—to 26 percent, which is close to the OECD average of 24 percent. This cut follows a period of three decades of a global downward trend in corporate tax rates, during which the United States had kept its rate roughly constant.

**2. Apart from the tax rate cut, the recent U.S. reform also included a host of additional measures with sometimes counteracting effects.** Further tax-reducing measures include: expensing of investment; a shift to a territorial system, which exempts foreign profits of U.S. multinationals (except to the extent covered by 'Global Intangible Low-Tax Income' (GILTI), see below); and 'Foreign Derived Intangible Income' (FDII), which effectively provides a preferential CIT rate for the export share of profits that exceed 10 percent of tangible assets. Other measures that aim at reducing profit-shifting out of the United States are likely to increase tax liabilities of U.S. firms: GILTI creates a minimum U.S. tax on foreign active income without deferral, but with a foreign tax credit; and the 'Base Erosion Anti-Abuse Tax' (BEAT) functions as an alternative minimum tax, which disallows deduction of most foreign related-party service costs.<sup>2</sup>

**3. Various other economies have also recently changed their tax treatment of corporate income.** In the region, in 2017 Vietnam reduced its statutory CIT rate from 22 to 20 percent. In Mainland China the rate remains unchanged, but a tax deferral concession for the reinvested earnings of foreign investors was introduced. Overall, Asia's average headline CIT

Regional CIT Rate Comparison (in percent)



Source: FAD TP Rates Database.

<sup>1</sup> Prepared by Sebastian Beer and Alexander Klemm (both FAD).

<sup>2</sup> For a more detailed description and assessment of the U.S. tax reform, see Chalk, Keen, and Perry (2018).

rate has remained stable at around 21 percent within the last three years, however, and Hong Kong SAR's 16.5 percent rate is comparatively low. Among the G7 economies, Italy reduced its CIT rate from 31.4 to 24 percent in 2017 and the United Kingdom from 20 to 19 percent in 2017. France announced a reduction in the headline CIT rate to 25 percent by 2022.

## B. Impact on Hong Kong SAR from U.S. Tax Rate Cut

**4. As a global financial center, Hong Kong SAR is particularly susceptible to changes in the international tax landscape, and its economy has strong links to the United States.** At the end of 2017, while only 2.1 percent of Hong Kong SAR's inward foreign direct investment (FDI) stock is directly financed from the United States, this figure likely conceals indirect investment going through offshore centers, which account for 45 percent of total FDI in Hong Kong SAR.<sup>3</sup> Other data confirm strong economic ties between the United States and Hong Kong SAR: For instance, 13 percent of local offices are established by U.S. corporations (Census and Statistics Department HKSARG).

**5. Under constant policies, corporate tax revenue in Hong Kong SAR might decrease by 5 percent due to changes in firms' incentives of where to report profits and undertake real investment.** Beer, Klemm, and Matheson (2018) estimate revenue spillovers from a one percentage point decrease in the U.S. CIT rate as follows:

$$\text{Revenue Loss (in \%)} = (\varepsilon_K \alpha + \varepsilon_S) \omega_{HKG} \Delta t_{US}, \quad (1)$$

where  $\varepsilon_K$  denotes the semi-elasticity of capital with respect to the tax differential,  $\alpha$  is the capital intensity of production,  $\varepsilon_S$  is the semi-elasticity of reported profits with respect to the tax differential, and  $\omega_{HKG}$  is a country-specific weight, and  $\Delta t_{US}$  is the change in the U.S. statutory tax rate (14 percentage points). The first three parameters are taken from the ample empirical literature on the topic;<sup>4</sup> the weight is set at 14 percent as explained in the following paragraph. Combining the parameter estimates with this country-specific weight suggests that long-term revenue losses as a result of the combination of changes in where profits are reported and where real investment is undertaken, could be as high as 5 percent of CIT revenue (Equation 1). In the short run, revenue losses can be counteracted by any positive spillovers from a booming economy in the United States.

**6. The calculation of revenue spillovers for Hong Kong SAR requires choosing the economy-specific weight that reflects the importance of the U.S. market for the corporate tax base in Hong Kong SAR.** For instance, a weight of 1 would reflect a tax base that consisted entirely of MNCs with close ties to the United States; in contrast, a value of zero would reflect a tax base with no ties to the United States at all. Beer, Klemm, and Matheson (2018) use two types of weights:

<sup>3</sup> All data from Census and Statistics Department HKSARG. For the purposes of this calculation the British Virgin Islands, Cayman Islands, and Bermuda are counted as offshore centers. Investment coming from the Netherlands and Singapore is also likely to include investment originating elsewhere. Including those two countries, the ratio of FDI with unclear origin rises to 53 percent.

<sup>4</sup> Following Beer, Klemm, and Matheson (2018) it is assumed that  $\varepsilon_K = 2.4$ ,  $\alpha = 0.5$ , and  $\varepsilon_S = 1.5$ .

FDI weights and weights based on the number of links of multinationals to the United States. For Hong Kong SAR, using direct FDI weights does not appear appropriate given the likely underestimation of U.S. links as a result of FDI structured through offshore centers. Data on the number of ownership links are not available—which is unfortunate, as this measure would appropriately allow inclusion of all multinationals, not only U.S.-owned groups. As an approximation of the FDI link, this calculation uses the direct U.S. FDI of 2.5 percent and adds a share of the FDI coming from offshore centers. Specifically, it applies the global share of U.S. outward FDI stocks in total outward FDI stocks of 24.4 percent (UNCTAD, 2016) to the 47 percent of offshore center investment, yielding an estimated ratio of 14 percent.

### 7. Hong Kong SAR has no present plans to reduce its headline corporate income tax rate.

Modeling a typical competitive reaction by rate cutting, however, indicates that a reduction in Hong Kong SAR's CIT rate would aggravate—not forestall—the tax revenue losses estimated in the previous paragraph. Empirical evidence suggests that countries tend to reduce their CIT rates in response to other countries' tax rate cuts. The U.S. tax reform could thus trigger a new round of CIT rate cuts globally. To capture the combined revenue implications, including tax policy design reactions in other countries, Beer, Klemm, and Matheson (2018) augment equation (1) to add a policy response:

$$\text{Revenue Loss (in \%)} = \left[ \frac{\mu}{t} + (1 - \mu\omega_{HKG})(\varepsilon_K\alpha + \varepsilon_S) \right] \omega_{HKG}\Delta t_{US}. \quad (2)$$

Hong Kong SAR's tax rate is a policy choice that cannot be predicted by a model, but based on a review of the literature of fiscal reaction functions, one can estimate the likely tax cut, if all economies, including Hong Kong SAR, react just as they did on average in the past.<sup>5</sup> Here,  $\mu$  represents the change in Hong Kong SAR's CIT rate,  $t$ , that would on past evidence typically occur in response to a one percentage point reduction in the weighted tax rate  $\omega_{HKG}t_{US}$ . Then, including both Hong Kong SAR's hypothetical direct reaction to the U.S. cut, and indirect reactions to other countries' expected policy responses, the value of  $\mu$  is calibrated at 1.6. This would suggest in the model that Hong Kong SAR might reduce its CIT rate by 3 percentage points over the long run. This hypothetical direct reduction in the tax rate would translate into revenue losses of 18 percent, while changed profit-shifting and investment incentives would in this scenario reduce revenue by 4 percent rather than the 5 percent estimated initially. So, while the policy response mitigates revenue losses from MNC's reaction somewhat—from 5 to 4 percent of CIT revenue—the lower tax rate, which applies to both MNCs and domestic firms, would by far outweigh these marginal revenue savings.

<sup>5</sup> There is a large literature estimating fiscal reaction functions, a survey of which is provided by Leibrecht and Hochgatterer (2012).

## C. Impact from Other Reforms

**8. The impact from the other measures in the U.S. tax reform is harder to quantify, but also likely to be important.** Beyond the tax rate cut, which raises the relative attractiveness of the United States, the following effects can be expected:

- **Reported profits:** On one hand, FDII strengthens incentives to report in the United States and GILTI and BEAT make it harder to report profits outside the United States. On the other hand, territoriality reduces the cost of reporting profits outside the United States (when the other provisions are not binding).
- **Real investment:** On one hand, investing in the United States becomes more attractive because of expensing and, for some firms, FDII. On the other hand, territoriality makes investment outside the United States more attractive. GILTI (by exempting 10 percent return on capital) and BEAT (by allowing deductions for imported goods but not services) can, counterintuitively, also increase incentives for real investment outside the United States.
- **Competition between other countries:** Territoriality may also make U.S. multinationals more sensitive to foreign tax rates, so that the relative tax rate of Hong Kong SAR compared to other economies rises in importance. This is somewhat counteracted by GILTI.

**9. Tax cuts in other countries can be expected to intensify the impact, especially in the case of regional competitors.** As noted above, the average tax rate in the regions has not changed, but if this were to happen it would lead to further—likely negative—spillovers.

## D. Conclusions

**10. Hong Kong SAR has a competitive tax system and revenue losses resulting from spillovers from international tax reform are expected to be manageable.** In a policy response scenario—in which Hong Kong SAR and other economies are modelled to reduce their tax rates following the same reaction functions as on average in the past—revenue losses would be much greater. These can be avoided by maintaining the rate at the current level in response to the U.S. rate cut. In case of widespread regional tax cuts, the situation should be reassessed.

## References

Beer, S., A. Klemm, and T. Matheson, 2018, "Tax Spillovers from U.S. Corporate Income Tax Reform," *IMF Working Paper*, No. 18/166.

Chalk, N., M. Keen, and V. Perry, 2018, "The Tax Cuts and Jobs Act: An Appraisal," *IMF Working Paper*, No. 18/185.

Leibrecht, M. and C. Hochgatterer, 2012, "Tax Competition as a Cause of Falling Corporate Income Tax Rates: A Survey of Empirical Literature," *Journal of Economic Surveys* 26(4), 616-648.