

Asian Regional Income, Growth, and Distribution to 2030

DAVID ROLAND-HOLST, GUNTUR SUGIYARTO, AND YINSHAN LOH

As Asia consolidates the economic gains and policy lessons of two generations, it can look to a bright future of sustained growth. More effective policies will even accelerate this growth, provided they recognize the essential agents of trade and productivity growth, as well as the importance of promoting domestic regional demand. Rising incomes promise greater homegrown demand for domestic producers and essential diversification for regional exporters.

This study surveys historical income distribution data from 22 Asian economies, projects the emergence of middle classes in the next 20 years, and examines its role in Asian economies. The study also examines the drivers of growth over this period using a dynamic computable general equilibrium (CGE) model to forecast GDP and consumption trends.

The findings suggest that Asia can sustain and even accelerate current patterns of poverty reduction and livelihood advancement beyond poverty. Over the next 20 years, about 1 billion people will be added to the 2.7 billion Asian middle class (based on \$2-a-day PPP standard). The rate of middle class emergence will be uneven across the region and will depend mostly on initial conditions.

The results also suggest that energy price vulnerability is a critical risk to regional growth—and calls for energy efficiency measures to insure against this risk. The agricultural productivity growth can improve both the incomes of the majority of Asia's rural poor and the purchasing power of urbanites. Policies that reduce both energy and food costs can therefore be a potent source of new demand for products and services as well as jobs.

Finally, given the importance of labor resources to Asian growth, skills development is the most critical prerequisite for realizing the vast economic potential of Asia. Higher incomes, a larger middle class, and self-sustaining prosperity can only be built on the foundation of a skilled and productive labor force that captures significant value added and channels higher incomes into sustained long-term expenditure, savings, and investment.

JEL classification: O15, O4, O53

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I. INTRODUCTION

Asia's fast economic progress over the last five decades, i.e., from 1960-2010, has firmly established Asia as a model for growth and prosperity as driven by multilateral trade. The rest of the world now looks at the many facets of the "Asian Miracle" for essential lessons in entrepreneurship, savings-driven enterprise development, public sector fiscal responsibility, public goods provision, industrial leadership and, above all, effective trade promotion for growth and modernization. These successes have now matured in some Asian economies, where middle class majorities are facilitating post-industrial transition to more service-oriented economies.

Over the next two decades, the prospects for emerging Asia remain bright, and this continued success will pose new challenges and opportunities as sustained economic growth fosters changing patterns of economic activity and resource use. Here we focus on the forthcoming developments that are related to middle class emergence.

The middle class, which in western Organisation for Economic Co-operation and Development (OECD) economies was the primary driver of historical Asian export growth, has now begun to offer new and rapidly emerging home markets for local producers. In addition, other new developments have emerged. First, homegrown demand changes the nature of macroeconomic management, especially the fiscal and monetary characteristics of aggregate demand management.

Second, the demographic scale of the middle class in emerging Asia may grow far beyond that of the previous generation. This means that Asian markets will further become more attractive not only to the firms in the region, but also to a growing number of multinationals that have established themselves in western markets. Thus, multilateralism from an Asian perspective will be as much about granting market access as about gaining it, and about new directions in supply chain partnerships, cross holdings, and joint ventures.

Third, the new middle class will fundamentally change the demands of their own societies, with growing emphasis on durables, services, and accumulation of assets. To accommodate these changes, the economic structures of Asian economies will have to adapt significantly. It may require a shift to post-industrial, higher value-added enterprise systems using more skill-intensive technologies that can sustain higher long-term wages.

Finally, rising regional incomes will build deeper reserves of aggregate savings, which will, in turn, require more extensive and diverse placement to yield reasonable rates of return. Until now, a significant portion of this allocation burden has fallen on western financial markets, sometimes with unwelcome consequences. In the long run, Asia must more effectively use its own investment resources and provide the infrastructure and private investment needed to support

broader regional development and sustained growth. This will require a dramatically larger capacity for bond and equity finance, which will ultimately be embedded in a new universe of more highly articulated Asian financial services.

The potential of all these developments for raising living standards is great, particularly for the majority of Asia's population that remains poor today. Inequality, both within and between Asian countries, has risen along with average incomes in this first phase of regional emergence, as early growth paragons, especially large cities, has captured the leading edge of globalization.

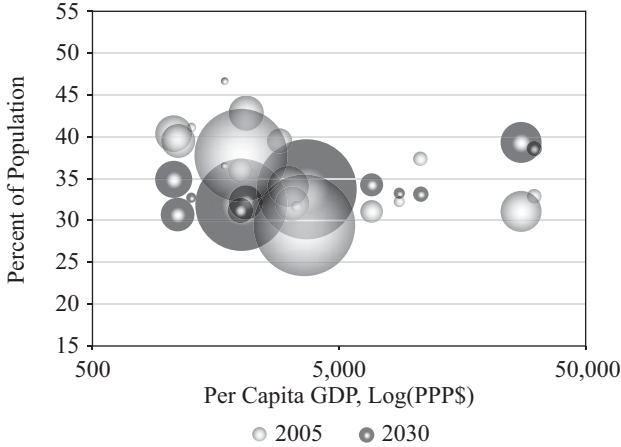
Asia now recognizes that more determined commitments to regionalism offer more opportunities for diversification in production, as well as superior economic gains from regionalism. With the aging population, and fiscal and financial uncertainties that challenge its traditional export markets, Asia needs a new source of trade growth. Fortunately, its economies have sustained the highest growth rates in the world for over a decade since the Asian financial crisis in 1997/98. With the right policy environment, the emergence of a regional middle class will accelerate this growth and diversify its markets in valuable ways.

Stronger commitments to open multilateralism are required, as access to Asian market becomes as valuable to Asian economies as its access to western market. If policy makers can deliver the right combination of hard and soft infrastructure, vast economic potential can be realized. Many of the pillars of the regional growth sources will be from the poorest Asian economies. More open multilateralism across Asia will be more inclusive, and this will propagate growth dividends where they are needed most, facilitating the economic convergence necessary to underwrite long-term economic and political stability.

In this study, the role of the middle class in Asia's economy is examined. In particular, historical income distribution data from 22 countries are surveyed and fitted econometrically to lognormal distributions to study how the income landscape has evolved in recent decades. These data are then calibrated to a dynamic global computable general equilibrium (CGE) model to project regional economic growth out to 2030 under different scenarios. In each scenario, the role of and effects on the middle class are examined in detail.

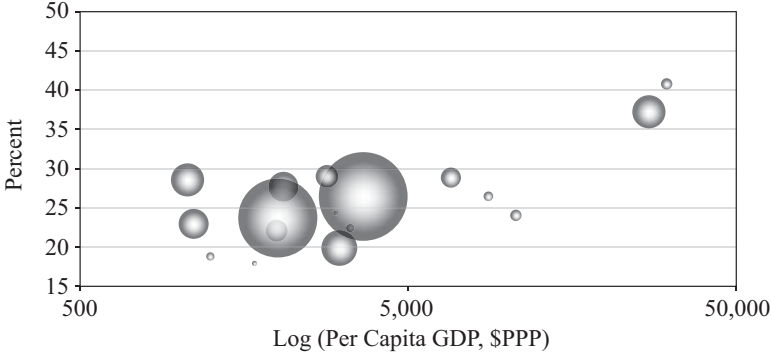
As this empirical work will demonstrate, innovation, diffusion, and adoption or investment in technologies that promote skill-intensive development and growth are essential elements of Asia's strategy to sustain its strong growth. The current challenge for Asia's lower and middle income economies is to recruit a large rural labor force into the formal sector, with an emphasis on creating a large number of jobs. This emphasis must shift toward job quality, value added, and development of skills and productivity that can sustain higher incomes as populations age because of declining birth rates and rising longevity. This poses an important challenge for most of the region's economies (Figure 1).

Figure 1. **Aging Asia: Age-Income Profiles across Asia**
Dependent Share of the Population (%)



GDP = gross domestic product, PPP = purchasing power parity.
 Note: Based on percent and log GDP per capita, respectively. The bubble diameter is proportional to national population.
 Source: Authors' calculations from official data.

Figure 2. **Share of Skilled Workers**



GDP = gross domestic product, PPP = purchasing power parity.
 Source: Authors' calculations from GTAP 7 database.

In a world where capital is internationally mobile, the only long-run justification for higher wages is higher labor productivity. This underlies much of Asia's success in income growth (Ravallion and Chen 2008). It also highlights the importance of education and human capital skills development to become the priority of the economies in the region. At the same time, human capital investments are needed to facilitate poverty reduction and reduce inequality. The literature on poverty shows that labor market access is the primary gateway to sustainable, higher living standards for the majority of the world's poor (Bardhan

1997, Carter and Barrett 2006, Dollar and Kraay 2001, Jalan and Ravallion 1998, Morduch 1998). Moreover, as country conditions improve substantially, a consensus emerges against extremes of inequality (Rawls 1971, Hirschman and Rothschild 1973, Atkinson 1995, Roemer 1998, and Persson and Tabellini 1994).

The next section presents a brief historical survey of regional income distribution and lessons learned. This is followed by a presentation of baseline projections in Section III and the regional forecast analysis in Section IV. Section V introduces the simulation scenarios, while Section VI discusses their results. The concluding section synthesizes discussions and presents policy implications.

II. RECENT HISTORY OF REGIONAL INCOME DISTRIBUTION

By nearly every economic or social indicator, Asia is an extremely diverse region. While diversity can support more effective market competitiveness and resource allocation efficiency, greater similarities are more desirable in other aspects.

Economies with sustained records of livelihood improvement can become good models for others. In the long run, divergence in per capita GDP growth can also lead to unwelcome regional disparities. Spatial economic integration has many advantages (Rodrik 2008, World Bank 1990); the challenge is to identify and promote the right facilitating policies to capture, sustain, and propagate such benefits across diverse regions.

On the supply side, enlargement of the market encourages competition and confers growth externalities between neighbors. Although Asia has been very competitive in shipping goods to western markets, a more complete regional integration toward greater market access and economic convergence will require investments in physical infrastructure, such as the Greater Mekong Subregion (GMS) corridor system, to overcome remaining trade and transport barriers. Since these barriers mostly affect low-income countries in the region, removing them will greatly benefit these countries.

Meanwhile, in addition to the spillovers effects of domestic growth (i.e., increased foreign direct investment and proliferation of regional supply chains), with greater labor mobility in the region, many low-income Asian economies will reap greater employment, income, and saving opportunities through migration and remittances (Adams 1991).

On the demand side, the emergence of the middle class in Asia could support the benefits from open regionalism that accrue due to both diversity and homogeneity of its economies. This is the opposite of the classical Ricardian supply-side case for expanding trade. As incomes rise, consumers diversify their tastes. Enlarging markets across more diverse economies will help satisfy these tastes more cost effectively. Also, even if regional economies are homogenous, as

in the European Union, an enlargement of the market offers economies of scale that can make product differentiation cost effective.

Table 1. Descriptive Statistics on Income Distribution in Asia (US \$)

Country	Year	Mean	Mode	Median	Std. Dev.
Armenia	1990	2,340	1,185	1,865	1,772
	1995	2,679	1,363	2,139	2,022
	2000	3,155	1,613	2,523	2,369
	2005	4,513	2,323	3,617	3,368
Azerbaijan (Baku)	1990	6,051	4,618	5,530	2,688
	1995	3,852	3,004	3,546	1,635
	2000	4,000	3,110	3,678	1,709
	2005	7,228	5,817	6,723	2,853
Azerbaijan (Other Urban)	1990	3,613	2,837	3,333	1,511
	1995	2,392	1,895	2,213	980
	2000	2,481	1,962	2,294	1,020
	2005	4,502	3,447	4,119	1,987
Azerbaijan (Rural)	1990	2,761	2,194	2,557	1,123
	1995	1,809	1,465	1,687	703
	2000	1,884	1,519	1,754	740
	2005	3,332	2,655	3,089	1,347
Bangladesh	1990	669	302	513	560
	1995	706	327	546	579
	2000	760	362	594	608
	2005	1,009	500	798	781
Brazil (Major Cities)	1990	6,077	866	3,174	9,924
	1995	6,777	987	3,565	10,954
	2000	6,941	1,025	3,669	11,146
	2005	7,454	1,149	3,997	11,733
Brazil (Other Urban)	1990	4,947	628	2,486	8,508
	1995	5,268	674	2,654	9,033
	2000	5,317	683	2,683	9,098
	2005	5,596	755	2,870	9,365
Brazil (Rural)	1990	3,449	422	1,712	6,033
	1995	3,618	444	1,798	6,320
	2000	3,710	455	1,844	6,479
	2005	3,974	511	2,006	6,793
Cambodia	1990	705	274	514	661
	1995	806	307	584	767
	2000	954	373	698	891
	2005	1,552	691	1,185	1,313
People's Republic of China	1990	810	229	532	930
	1995	1,174	294	740	1,446
	2000	1,685	406	1,049	2,118
	2005	2,723	644	1,683	3,461
People's Republic of China (Major Cities)	1990	1,257	314	792	1,549
	1995	1,797	457	1,139	2,195
	2000	2,564	662	1,632	3,106
	2005	4,183	1,001	2,596	5,282
People's Republic of China (Other Urban)	1990	1,003	274	650	1,176
	1995	1,379	365	885	1,647
	2000	1,856	514	1,210	2,159
	2005	2,877	777	1,859	3,396

Continued.

Table 1. *Continued.*

Country	Year	Mean	Mode	Median	Std. Dev.
People's Republic of China (Rural)	1990	692	220	472	741
	1995	981	271	639	1,142
	2000	1,368	363	879	1,633
	2005	2,065	567	1,342	2,414
Georgia	1990	4,670	1,438	3,154	5,101
	1995	2,115	677	1,446	2,255
	2000	3,056	957	2,075	3,304
	2005	4,672	1,438	3,155	5,105
India	1990	1,044	444	785	915
	1995	1,121	474	842	987
	2000	1,336	586	1,015	1,142
	2005	1,799	759	1,349	1,587
Indonesia	1990	1,356	609	1,039	1,138
	1995	1,835	839	1,414	1,518
	2000	1,928	895	1,493	1,576
	2005	2,634	1,234	2,046	2,137
Kazakhstan	1990	6,566	3,182	5,157	5,173
	1995	4,837	2,321	3,787	3,845
	2000	4,944	2,365	3,867	3,940
	2005	6,035	2,897	4,725	4,794
Lao People's Democratic Republic	1990	1,014	512	807	771
	1995	1,184	592	940	908
	2000	1,107	553	878	849
	2005	1,335	657	1,054	1,038
Malaysia	1990	4,452	1,247	2,913	5,146
	1995	5,296	1,510	3,485	6,057
	2000	5,060	1,422	3,314	5,838
	2005	6,158	1,781	4,073	6,985
Mongolia	1990	1,790	589	1,236	1,876
	1995	1,372	442	940	1,457
	2000	1,761	572	1,210	1,860
	2005	1,846	599	1,268	1,952
Nepal	1990	687	221	471	731
	1995	696	222	476	742
	2000	784	246	532	846
	2005	909	284	617	983
Pakistan	1990	1,622	894	1,330	1,132
	1995	1,864	1,038	1,533	1,288
	2000	1,921	1,068	1,580	1,331
	2005	2,745	1,525	2,257	1,902
Papua New Guinea	1990	824	213	524	997
	1995	768	202	492	921
	2000	735	196	473	875
	2005	1,095	276	692	1,343
Philippines	1990	2,012	563	1,316	2,326
	1995	2,089	587	1,369	2,409
	2000	2,131	600	1,397	2,456
	2005	2,520	693	1,639	2,942

Continued.

Table 1. *Continued.*

Country	Year	Mean	Mode	Median	Std. Dev.
Sri Lanka	1990	2,703	1,470	2,206	1,914
	1995	1,993	1,083	1,627	1,412
	2000	2,261	1,237	1,849	1,591
	2005	3,852	2,060	3,127	2,771
Tajikistan	1990	2,294	1,144	1,819	1,763
	1995	961	455	749	773
	2000	1,234	622	982	939
	2005	1,578	815	1,266	1,174
Thailand	1990	3,102	1,137	2,220	3,027
	1995	3,890	1,438	2,792	3,776
	2000	4,050	1,491	2,903	3,940
	2005	4,967	1,912	3,613	4,686
Timor-Leste	1990	712	314	542	607
	1995	950	458	745	752
	2000	668	296	509	568
	2005	805	354	612	688
United States (Major Cities)	1990	19,641	11,769	16,558	12,529
	1995	19,976	12,263	16,978	12,386
	2000	20,863	13,623	18,099	11,960
	2005	21,510	14,707	18,949	11,553
United States (Other Urban)	1990	18,320	10,100	15,022	12,789
	1995	18,890	10,795	15,676	12,701
	2000	19,762	12,005	16,737	12,407
	2005	20,374	12,881	17,486	12,182
United States (Rural)	1990	17,575	9,291	14,211	12,789
	1995	18,103	9,858	14,783	12,795
	2000	19,033	10,983	15,846	12,665
	2005	19,650	11,819	16,587	12,481
Uzbekistan	1990	1,218	716	1,021	794
	1995	743	422	615	503
	2000	991	586	832	642
	2005	1,270	755	1,068	817
Viet Nam	1990	989	427	747	857
	1995	1,037	452	786	892
	2000	1,146	522	882	951
	2005	1,815	853	1,411	1,469
World	1990	4,816	173	1,589	13,781
	1995	4,779	221	1,716	12,423
	2000	5,029	267	1,889	12,407
	2005	5,705	411	2,374	12,466

Note: Std. Dev = standard deviation of income.

Source: Canback-Dangel, 2010.

The demand of the expanding middle class in the region will compete with the exports demand, and will eventually become the main driver of growth in the region, as well as a key determinant of economic structure. To better understand how this transition will occur, the historical and projected future trends in Asian income distribution in 22 economies in the region are analyzed and summarized in this section.

We look at recent history, which is most relevant given the rapid economic changes that have taken place in Asia. Therefore, to analyze the reciprocal links between economic growth and income distribution, historical data on income distribution by decile in 22 economies from 2010 to 2030 for Asian and other prominent economies and regions were drawn from the World Bank’s Global Income Distribution Database (GIDD) and fitted econometrically to continuous lognormal distributions. Parameter estimates were then used to estimate income distribution trends by country and calibrated to a CGE model to predict middle class emergence trends across Asia. The estimation technique is described in Box 1.

Box 1. Estimation Technique

Using data from the Canback-Dangel Global Income Distribution Database (GIDD) we econometrically estimated the parameters of lognormal distributions of 34 Asian and other related economies.¹ The lognormal distribution has a continuous distribution function

$$F(x) = 1 - N\left(\frac{\ln x - m}{v}\right) \tag{1}$$

where m and v are mean and variance parameters, each positive, for positive random variable (income per capita) $x > 0$. The probability density function is

$$f(x) = \frac{1}{x\sqrt{2\pi v^2}} e^{-\frac{(\ln x - m)^2}{2v^2}} \tag{2}$$

The likelihood function for a sample of observations x is specified as the product of the densities for each observation (weighted where relevant for grouping), and is maximized using a nonlinear solution algorithm in STATA program.

The formulas used to derive the distributional summary statistics are as follows. The r -th moment about the origin is given by

$$m_r = e^{\left(m + \frac{r^2 v}{2}\right)}. \tag{3}$$

Hence, $mean = m_1 = e^{\left(m + \frac{v^2}{2}\right)}$ and $variance = m_2 = p(p-1)e^{(2m)}$, where $p = e^{v^2}$ from which the standard deviation and half of the squared coefficient of variation can be derived. The mode is $mode = e^{(m-v^2)}$.

The quantiles q_i are derived by inverting the distribution function:

$$x_i = e^{\left(m + vN^{-1}(q_i)\right)} \text{ for each } q_i = F(x_i). \tag{4}$$

The Gini coefficient of inequality is given by

$$Gini = 2N\left(\frac{v}{\sqrt{2}}\right) - 1. \tag{5}$$

¹The information from this database are proprietary.

III. BASELINE PROJECTIONS OF INCOME DISTRIBUTIONS

This section looks at how income distributions in Asian economies are expected to shift with growth and structural change in Asia over the next 20 years, with focus on middle class emergence.

We calibrate a global CGE forecasting model with a 2005 reference global database obtained from the Global Trade Analysis Project (GTAP) Version 7 to a business-as-usual baseline policy environment. The baseline comprises forecasts for real gross domestic product (GDP) growth by country over 2010–2030, as assembled by the World Bank and presented in its annual Global Economic Prospects reports. We focus on 16 countries, 5 regions, and 10 sectors listed in Table 2².

Table 2. **Classifications of Countries, Regions, and Sectors**

Country	
1	Australia and New Zealand
2	Bangladesh
3	People's Republic of China
4	Georgia
5	Indonesia
6	India
7	Kazakhstan
8	Cambodia
9	Lao People's Democratic Republic
10	Sri Lanka
11	Malaysia
12	Pakistan
13	Philippines
14	Thailand
15	United States
16	Viet Nam
Region	
1	Europe-27
2	High Income Asia
3	Latin America and the Caribbean
4	Rest of Asia
5	Rest of the World
Sector	
1	Crops
2	Livestock and Fishery
3	Energy Extraction and Exploration
4	Other Minerals and Mining
5	Processed Food
6	Textiles and Apparel
7	Light Manufacturing
8	Heavy Manufacturing
9	Utilities
10	Services

²The GTAP database contains detailed information on the economic structure and trade flows for 57 sectors in 118 countries and regions.

Using our parameters estimates in the previous section and our calibrated global CGE model we forecast the emergence of the middle classes in our sample economies over the next two decades.

Estimates of absolute and relative sizes of the middle classes in our sample countries, corresponding to each of the following four alternative definitions of middle class threshold are presented in Figures 3, 4, and 5:

1. Mean – population whose per capita incomes are greater than 75% of the national mean.
2. Median – population whose per capita incomes are greater than 75% of the national median.³ For a lognormal distribution such as the one used to model income composition in this exercise, the median threshold qualifies approximately 80% of the domestic population (at different poverty lines in different countries).⁴
3. >\$2-a-day PPP (Purchasing Power Parity) Standard – population whose per capita daily income exceeds \$2-a-day.
4. >\$4-a-day PPP Standard – population whose per capita daily income exceeds \$4-a-day.

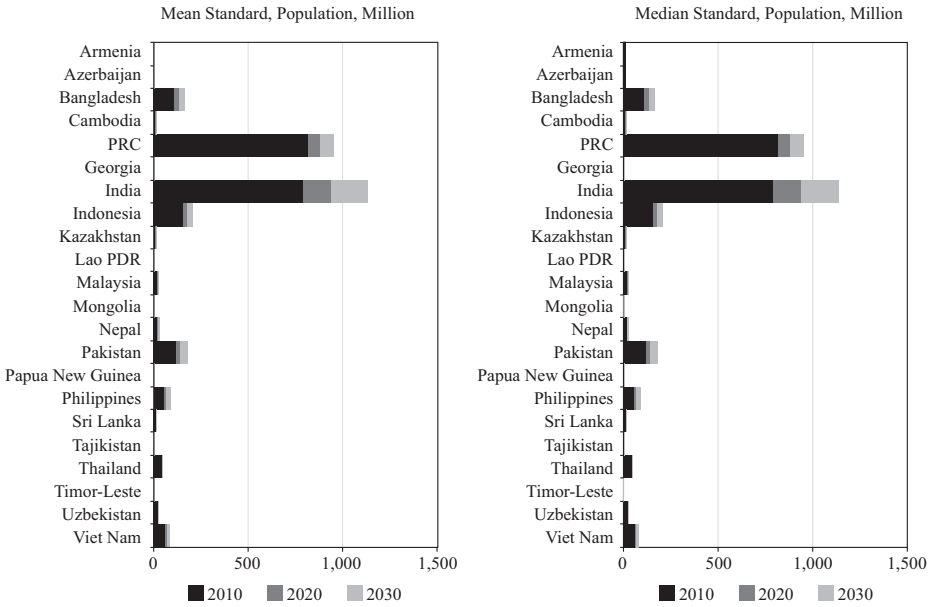
As these figures suggest, consensus growth estimates for Asia are relatively optimistic, not only for aggregate real growth but also in terms of the scope of growth's benefits. If middle class status can be interpreted as exiting poverty, then approximately 1 billion more people in Asia will be above the \$2-a-day poverty threshold by 2030, adding to the 2.7 billion people above this level in 2010.

The mean and median thresholds are measured relative to each country's income distribution. As such, these represent fairly constant proportions of own population. Nonetheless, the total number of people above 75% of either income milestone gives a concrete idea about the distribution of middle-income status across the region. As would be expected, because mean income is usually above median, the income group below the mean is uniformly larger, and for demographic reasons, the People's Republic of China (PRC) and India dominate regional emerging middle class status (see Figure 3).

³The first two standards are variants of poverty lines defined by Birdsall, Graham, and Pettinato (2000).

⁴The 20th percentile threshold was popularized first by Kuznets (1966) and more recently by Easterley (2001).

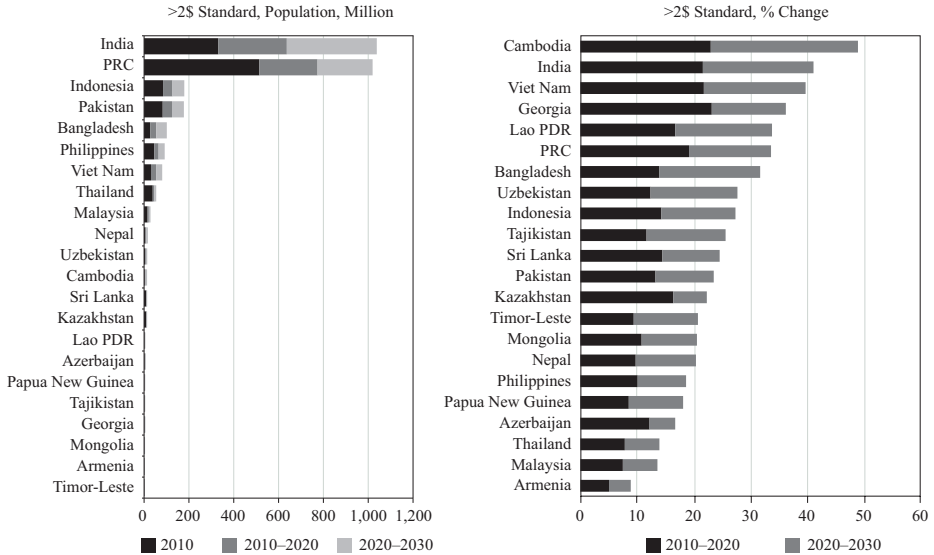
Figure 3. Middle Class Emergence to 2030 based on Mean and Median Standards



PRC = People’s Republic of China, Lao PDR = Lao People’s Democratic Republic, PNG = Papua New Guinea. Source: Authors’ estimates.

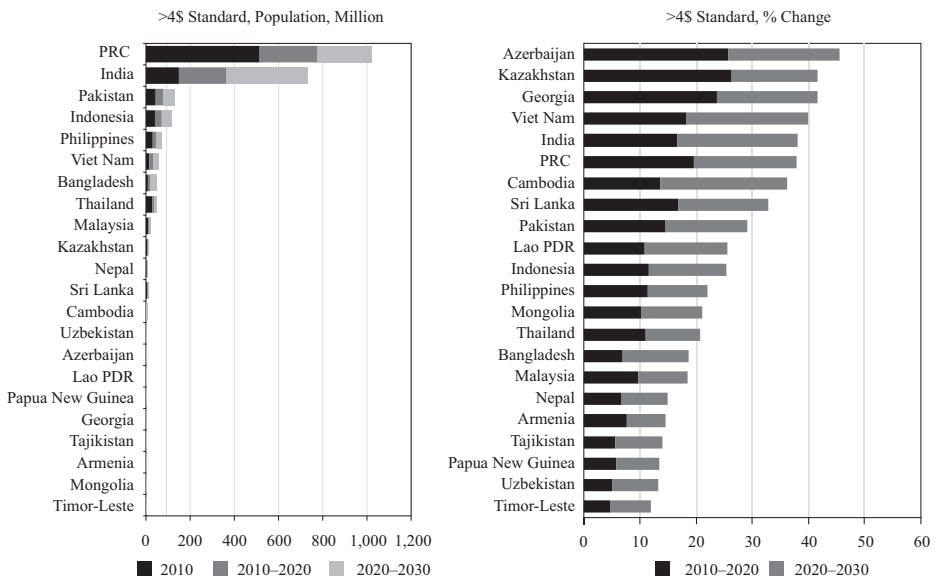
In contrast, absolute income thresholds can be compared across countries in terms of population share. As Figures 4 and 5 show, Asian Development Bank’s (ADB) developing member countries (DMCs) are at various stages of middle class emergence. In some countries, now approaching middle-income majorities, over 75% of their population will be in this category by 2030, even after accounting for inflation. Between now and 2030, under the baseline scenario, the baseline gross domestic product (GDP) growth is expected to more than double the share of those with income of \$2 or more per day in the largest countries (i.e. PRC and India). Some lower income countries, such as Cambodia and Lao People’s Democratic Republic, will see an even greater share in income growth for the middle income group—evidence of the pro-poor nature of the regional economic growth and integration process. However, other countries, such as Timor-Leste and Uzbekistan, will likely see only a modest enlargement of the middle class unless complementary policies are put in place, such as more extensive infrastructure development and trade facilitation.

Figure 4. Middle Class Emergence to 2030 based on >\$2-a-day Standard (Million)



PRC = People’s Republic of China, Lao PDR = Lao People’s Democratic Republic, PNG = Papua New Guinea. Source: Authors’ estimates.

Figure 5. Middle Class Emergence to 2030 based on \$4-a-day Standard (Million)



PRC = People’s Republic of China, Lao PDR = Lao People’s Democratic Republic, PNG = Papua New Guinea. Source: Authors’ estimates.

Countries with higher levels of per capita energy resource endowments can expect to benefit substantially from sustained regional growth. Countries with majorities already at \$2-a-day PPP or above (Malaysia and Thailand) will manage a sustained enlargement of these groups, on that modestly outpaces population growth.

Table 3 shows the emergence of the Asian middle class in the next 20 years, in terms of the four thresholds described earlier. Both the mean and median standards are relative to domestic economic conditions, and therefore merely reflect absolute demographic size of Asia in global population. The absolute (2005 PPP) middle class thresholds, however, can be used for international comparisons.

Table 3. **Percentage of Emerging Asian Population in the Global Higher Income**

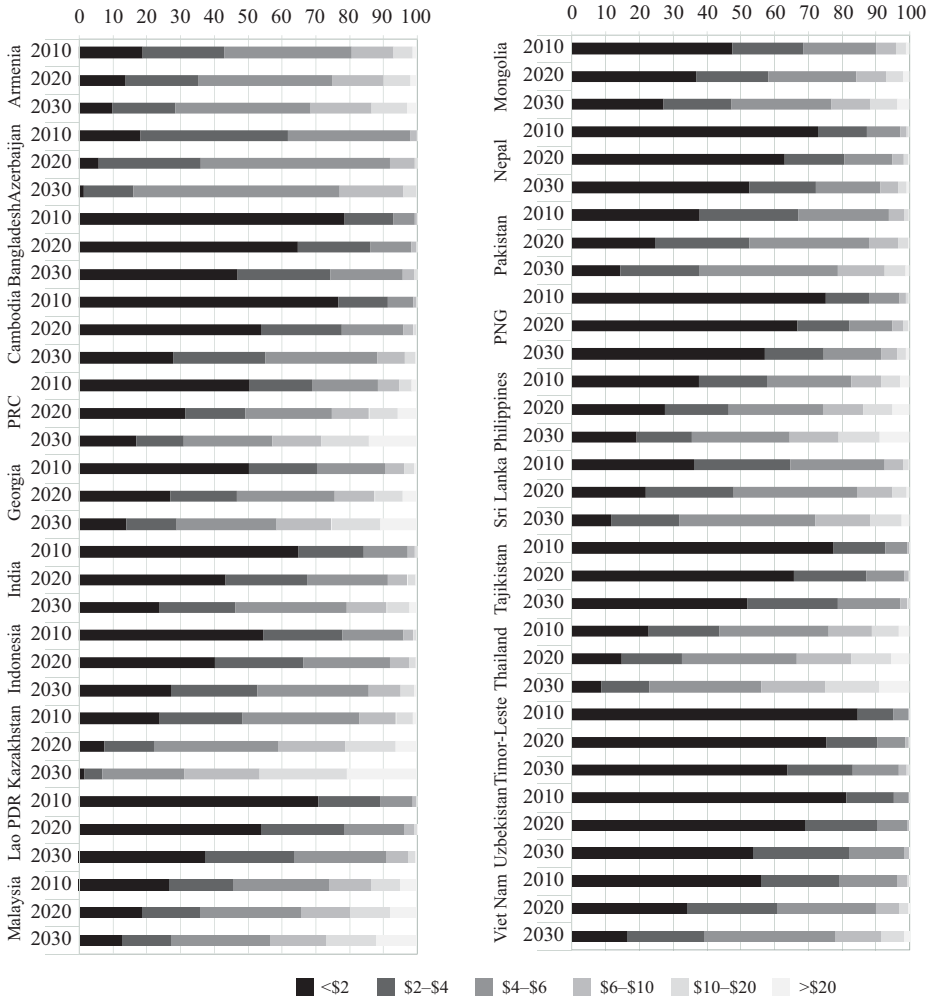
Standard	2010	2020	2030
Mean	60	63	67
Median	52	55	60
>\$2.00	25	39	55
>\$4.00	11	22	39

Source: Authors' estimates.

The table shows that the share the global middle class in emerging Asia will more than double by 2030 for the \$2-a-day threshold and will more than triple for the \$4-a-day threshold. The basic message of these estimates is that Asia will have the majority of (i) total population, (ii) non-poor population, and (iii) over one-third of the world's population with incomes exceeding \$4-a-day.

Finally, Figure 6 presents the projected income distributions in 2010, 2020, and 2030 for all countries analyzed. These bars estimate changes in domestic and global income distribution by country and globally, using absolute 2005 PPP income per day milestones of \$1.25, \$2, \$4, \$6, \$10, and \$20. Based on the World Bank consensus baseline growth rates, we see a steady but varied progress across the Asian region.

Figure 6. Baseline Income Distributions for Consensus Real GDP Growth Trends (percent of population in each income group)



GDP = gross domestic product, PRC = People’s Republic of China, Lao PDR = Lao People’s Democratic Republic, PNG = Papua New Guinea.
 Source: Authors’ estimates.

IV. REGIONAL GROWTH, INCOME DISTRIBUTION, AND STRUCTURAL CHANGE TO 2030

This section reports the results of economic forecasts that extend the baseline trends discussed earlier, to consider a variety of external events that might affect the level and composition of Asian economic growth over the next two decades.

An economic forecasting model is no crystal ball, but it does capture a broad array of structural relationships that can affect long-term patterns of demand, supply, and resource use. The complexities of today's global economy make it unlikely that policy makers relying on intuition or rules-of-thumb will achieve optimality in either the international or domestic arenas. Market interactions are so pervasive, and market forces so powerful in determining economic outcomes that more sophisticated empirical research tools are needed to help both public and private sector decision makers. CGE models are the preferred tool for detailed empirical analysis of an economic policy. They are ideally suited to trade-related analysis because they can detail the structural adjustments within national economies, as well as the interactions of domestic markets with international markets. The model is more extensively discussed in van der Mensbrugge (2008), but a few general comments will facilitate discussion and interpretation of the scenario results that follow.⁵

The CGE model is a system of simultaneous equations that simulate price-directed interactions between firms and households in commodity and factor markets. The roles of government, capital markets, and other trading partners are also specified, with varying degrees of detail and passivity, to close the model and account for economy-wide resource allocation, production, and income determination.

The role of markets is to mediate exchange, usually with a flexible system of prices, the most important endogenous variables in a typical CGE model. As in a real market economy, commodity and factor price changes induce changes in the level and composition of supply and demand, production and income, and the remaining endogenous variables in the system. In CGE models, an equation system is solved for prices that correspond to equilibrium in markets and satisfy the accounting identities governing economic behavior. If such a system is precisely specified, equilibrium always exists and such a consistent model can be calibrated to a base period data set. The resulting CGE model is then used to simulate the economy-wide (and regional) effects of alternative policies or external events.

The distinguishing feature of a general equilibrium model, applied or theoretical, is its closed-form specification of all activities in the economic system

⁵The model used here is typical of modern global models and is based on the LINKAGE model developed at the World Bank (van der Mensbrugge, 2008).

under study. This can be contrasted with more traditional partial equilibrium analysis, where links to other domestic markets and agents are deliberately excluded. A large and growing body of evidence suggests that indirect effects (e.g., upstream and downstream production links) arising from policy changes are not only substantial, but may in some cases even outweigh direct effects. Only a model that consistently specifies economy-wide interactions can fully assess the implications of economic policies or business strategies. In a multi-country model, such as the one used in this study, indirect effects include the trade links between countries and regions, which themselves can have policy implications.

The present global modeling facility has been constructed according to generally accepted specification standards, implemented in the General Algebraic Modeling System (GAMS) programming language, and calibrated to Version 7 of the GTAP global economic database.⁶ The result is a 20-country or region, 10-sector global CGE model, calibrated over a 25-year time path from 2005 to 2020. Apart from its traditional neoclassical roots, an important feature of this model is product differentiation, where it is specified that imports are differentiated by country of origin and exports are differentiated by country of destination. This feature allows the model to capture the pervasive phenomenon of intra-industry trade, where a country is both an importer and exporter of similar commodities, and avoids tendencies toward extreme specialization.

Using this aggregation, the dynamic CGE model is calibrated to a baseline time series reflecting a business-as-usual scenario over 2006–2030. This baseline comprises consensus forecasts for real GDP obtained from independent sources (e.g., International Monetary Fund, Data Resources International, and Cambridge Econometrics). The model is then run forward to meet these expected growth targets, calculating the implied productivity levels in each year, country, and region. This calibration yields productivity growth that would be needed to attain the macro trajectories, and these are then held fixed in the model under other policy scenarios. Other exogenous macro forecasts could have been used and compared, but this is the standard way to calibrate these models.

Once baseline trend forecasts for all the regional economies have been determined, their implied income distributions can be calculated, and the size of the middle and other classes assessed. This was done using independent initial year data and lognormal distribution.

⁶See e.g., Hertel et al (2008) for GTAP.

V. COUNTERFACTUAL SCENARIOS

To better understand the role of the middle class in the Asian regional growth process, it is useful to see how baseline trends could change depending upon external influences or policy actions on the level and composition of economic growth in the next two decades. We consider the following two growth scenarios that are likely to evolve over 2010–2030:

Scenario G1 (Baseline 1) – Business-as-usual growth trend based on World Bank’s consensus GDP growth rates.

Scenario G2 (Baseline 2) – Lower growth rates, i.e., 50% of GDP growth rates in G1.

Baselines for regional growth under business-as-usual (G1 and G2). In addition to the consensus growth baseline used in the previous section, a referent baseline with less optimistic growth rates, equal for each country to half the baseline growth rates projected by the World Bank, is considered. The lower rates are intended less to reveal the direct effect of pessimistic baseline growth than to show how the same policies (below) affect the regional economy in a lower growth environment.

1. **Energy price escalation (P).** Emerging Asian growth has been accompanied by very strong dynamics in global energy markets, and long-term conventional energy prices are subject to considerable uncertainty. To shed light on the region’s growth vulnerability to more pessimistic price trends, we include a counterfactual scenario in which increases in global fossil fuel prices will be sustained and increase by 50% in 2030.
2. **Energy efficiency (E).** Improvements in energy efficiency have been shown to be a potent catalyst for economic growth, as well as an important mitigation strategy against higher energy costs and greenhouse gas emissions. We consider a scenario with 1% average annual energy efficiency improvements across economies.
3. **Agricultural productivity growth (A).** Agrofood products are critical to both basic livelihoods and economic growth potential (see e.g., Boucher, et al 2008, and Datt and Ravallion 1998) because they are tied directly to the income of the majority of the world’s rural poor and they dominate the poor’s expenditures. We include a counterfactual with total factor productivity growth in agriculture of 1% per year from 2010 to 2030.
4. **Skill intensive growth (S).** Increasing labor productivity is the key not only to superior aggregate growth, but also to more extensive growth benefits across the population (Ravallion and Chen 2007). To assess these

benefits, this counterfactual assumes a 1% annual labor productivity growth up to 2030.

5. **Combined scenario (PEAS).** This is a combination of all the above factors.

VI. SIMULATION RESULTS

Table 4 summarizes the macroeconomic results for G1. The three most salient features of these estimates are: (i) the varied nature of the results across countries, (ii) strong synergies with the combined policies, and (iii) consistent pro-poor impact. Overall, simulation results are robust with respect to these differences in alternative values around the median parameters, and what variation they exhibit is consistent with economic intuition and the results interpretation that follows.

Table 4. **GDP Results by Country**
(percent change from baseline in 2030)

Item	GIP	GIPE	GIPA	GIPS	GIPEAS
Bangladesh	-9.37	-8.66	-7.34	11.66	17.50
PRC	-6.73	-4.28	-4.96	10.70	17.69
Georgia	-1.61	-2.04	-1.23	2.90	3.06
High Income Asia	-0.97	-0.13	-0.64	-0.82	0.46
Indonesia	-7.51	-5.38	-5.16	13.19	22.75
India	-9.00	-5.57	-6.35	11.13	21.29
Kazakhstan	-14.37	-10.75	-12.53	6.66	14.62
Cambodia	-10.50	-9.06	-6.70	9.38	20.54
Lao PDR	-11.39	-10.42	-4.84	11.34	33.26
Sri Lanka	-5.84	-4.96	-2.91	12.63	24.65
Malaysia	-7.10	-4.75	-6.66	16.12	20.98
Pakistan	-9.35	-8.06	-6.67	7.50	17.08
Philippines	-6.04	-4.31	-3.39	11.01	21.05
Thailand	-6.48	-1.60	-4.13	6.50	19.00
Viet Nam	-9.45	-9.02	-7.32	7.88	15.57
Rest of Asia	-7.18	-5.76	-5.64	11.75	17.70
Total	-5.39	-3.38	-3.93	6.83	12.54

GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic,

PRC = People's Republic of China.

Note: High income Asia includes Japan; Republic of Korea; Taipei, China; and Singapore.

Source: Author estimates.

Sustained increases in energy prices have clearly an adverse impact across all economies, even when two decades are allowed for adjustment. Lower growth hits the entire region, including oil exporters because of fuel substitution (to domestic coal) by leading importers like the PRC and India. Unfortunately, the impact of lower growth is most adverse in lower income economies, that are less competitive and are only on the early stage of integration with the rest of the world.

Energy efficiency mitigates these adverse affects, but only partially. The extent of this benefit depends on the country's prior energy intensity and its domestic energy substitution capacity. For example, both the PRC and Thailand initially have high energy intensity, but the PRC has ample alternative fuel supplies. Thailand, by contrast, benefits more from energy efficiency because it has fewer or higher cost alternative supplies.

Unlike in more advanced countries, improving agricultural productivity in emerging Asia only has limited benefits against higher fuel prices since agricultural mechanization, and therefore energy intensity, is only limited.

Labor productivity, on the other hand, can have a strong offsetting effect on higher energy prices. There are two primary reasons for this. Firstly, labor is arguably still the most important factor of production (in terms of value added) in most of Asia, and productivity growth in this factor can offset higher costs for just about any other factor. Second, the Keynesian benefits of labor productivity growth, in terms of direct income increases for households with high expenditure propensities, have a strong growth dividend in what is still a region of low average incomes and commensurately high expenditure propensities.

Strong synergies are apparent when the three factors are taken together for every economy. This effect results from combining savings in two essential commodity categories, food and fuel, with higher real incomes from a wage stimulus. The effects, aggregated over 20 years, more than compensates for higher energy prices and yields double digit growth dividends in most of the region's economies over 2030 GDP values.

Finally, the pro-poor aspect of the combined policies is both strong and consistent with intuition. Although every country benefits from rising labor productivity, those with the lowest initial levels of productivity and real wages benefit the most. These countries see the greatest relative benefit because their human capital is most in need of improvement and because their competitiveness improves most as a result of increased labor productivity as a result of policies that augment human capital development. It has long been recognized that labor is the prime resource of the emerging Asian economies, and skill-intensive development is clearly the superior strategy to realize its growth potential.

For the sake of comparison, Table 5 presents analogous scenario results for real aggregate household consumption. The most significant insight from this table has to do not with the qualitative results, which mirror GDP in sign across every country and scenario, but with the magnitudes. Both the negative and positive effects have wider extremes in terms of real consumption, which would make the events examined here much more politically sensitive. Negative energy price effects on GDP can be offset by structural adjustment that transfers resources from other activities, but they hit purchasing power more directly. At the other extreme, the benefits of higher wages may accelerate aggregate growth through the compounding of multiplier effects, but the original impetus for this is

higher disposable income and a very direct increase in expenditure. Because productivity growth also lowers domestic real prices, and more so when initial productivity is lower, poorer countries benefit more in terms of real purchasing power.

Table 5. **Real Aggregate Consumption Results by Country**
(percent change from baseline in 2030)

Item	G1P	G1PE	G1PA	G1PS	G1PEAS
Bangladesh	-13.20	-11.89	-10.20	10.88	19.01
PRC	-15.38	-10.71	-11.79	8.60	22.44
Georgia	-9.04	-8.44	-6.25	0.01	2.91
High Income Asia	-3.29	-1.31	-2.74	-2.40	0.33
Indonesia	-7.13	-5.66	-3.96	17.41	26.86
India	-14.20	-8.65	-10.45	10.37	25.36
Kazakhstan	-13.34	-11.11	-11.06	12.06	19.36
Cambodia	-18.73	-16.12	-12.84	5.18	23.63
Lao PDR	-9.93	-10.22	-0.73	20.59	44.09
Sri Lanka	-7.56	-5.06	-3.04	15.83	30.09
Malaysia	-11.95	-9.47	-10.72	18.83	27.47
Pakistan	-12.42	-9.70	-9.03	6.27	17.09
Philippines	-9.42	-5.83	-5.99	11.40	23.51
Thailand	-8.70	-1.51	-5.87	7.84	21.95
Viet Nam	-7.83	-9.63	-4.54	13.37	19.66
Rest of Asia	-8.07	-7.17	-5.47	16.80	23.63
Total	-10.03	-6.54	-7.57	5.62	15.08

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Note: High income Asia includes Japan; Republic of Korea; Taipei, China; and Singapore.

Source: Author estimates.

Tables 7 and 8 presents the simulation results under the alternative scenario—lower growth baseline (G2). The GDP results under the low growth scenario (Table 7) are clearly similar to the results under the business-as-usual scenario (Table 5). As can be seen in Table 8, while halving consensus growth rates sharply reduces aggregate income growth over the next 2 decades, the compositional and relative effects of external shocks and policy responses are similar under the two scenarios. In other words, structural (as opposed to cyclical or monetary) policy responses remain effective even when aggregate long-term growth trends shift. The conclusions of the previous paragraphs thus apply whether growth expectations are bullish or more temperate. Risk due to energy price hikes remains substantial, and energy efficiency, agricultural productivity growth, and skill development can work together to offset this risk and accelerate regional growth substantially.

The most significant difference between consensus and sub-consensus baseline results are its pro-poor effects. While pro-poor effects are significant under both growth scenarios, it is strongest under the low-growth scenario. The same observation applies to aggregate consumption results, perhaps even more important to lower income countries. These facts imply that affirming policies

such as those studied here is even more important when there is uncertainty regarding aggregate growth potential. When adversity threatens to lower expectations, even more policy determination is justified to protect and enhance livelihoods.

**Table 6. Real GDP Results by Country
(percent change from baseline in 2030)**

Item	G2P	G2PE	G2PA	G2PS	G2PEAS
Bangladesh	-8.08	-7.31	-5.87	15.00	21.15
PRC	-4.46	-2.11	-2.87	18.42	25.21
Georgia	-6.23	-5.77	-3.40	9.37	16.77
High Income Asia	-0.63	0.22	-0.34	-0.43	0.75
Indonesia	-6.61	-4.70	-4.21	16.52	26.53
India	-7.33	-3.67	-4.81	14.86	26.17
Kazakhstan	-10.81	-6.33	-9.32	11.37	19.80
Cambodia	-8.87	-7.44	-5.19	14.47	26.79
Lao PDR	-12.18	-11.40	-4.60	14.28	41.19
Sri Lanka	-5.82	-4.96	-2.13	15.83	30.40
Malaysia	-6.36	-4.01	-5.88	18.81	23.80
Pakistan	-8.86	-7.54	-5.86	10.01	19.96
Philippines	-4.80	-3.14	-2.22	13.89	23.93
Thailand	-4.55	0.52	-2.25	9.67	22.31
Viet Nam	-8.99	-8.77	-6.32	10.90	20.28
Rest of Asia	-5.76	-4.38	-4.16	15.08	21.14
Total	-3.48	-1.66	-2.26	9.27	14.42

GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic,

PRC = People's Republic of China.

Note: High Income Asia includes Japan; Republic of Korea; Taipei,China; and Singapore.

Source: Author estimates.

**Table 7. Real Aggregate Consumption Results by Country
(percent change from baseline G2 in 2030)**

Item	G2P	G2PE	G2PA	G2PS	G2PEAS
Bangladesh	-12.08	-10.72	-8.86	14.52	23.50
PRC	-11.57	-7.08	-8.34	20.73	34.54
Georgia	-13.35	-11.30	-8.85	6.42	18.05
High Income Asia	-2.73	-0.87	-2.20	-1.82	0.79
Indonesia	-6.28	-5.03	-3.29	21.12	30.45
India	-12.21	-6.84	-8.50	15.63	31.36
Kazakhstan	-9.20	-5.99	-7.16	19.15	27.64
Cambodia	-15.63	-13.27	-9.95	11.87	30.70
Lao PDR	-13.11	-12.76	-3.65	19.36	45.32
Sri Lanka	-8.08	-5.83	-3.39	17.56	31.98
Malaysia	-12.06	-9.41	-10.28	23.66	33.90
Pakistan	-12.34	-9.84	-8.73	8.31	19.70
Philippines	-8.17	-4.90	-5.06	13.98	25.19
Thailand	-7.58	-0.38	-5.12	9.52	23.10
Viet Nam	-7.73	-8.79	-4.29	15.85	23.57
Rest of Asia	-7.35	-5.86	-4.88	20.18	27.74
Total	-7.16	-4.08	-5.12	9.10	17.51

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Note: High Income Asia includes Japan; Republic of Korea; Taipei,China; and Singapore.

Source: Author estimates.

How far can the policies go to offset lower growth trends? Table 7 gives some insight on this question, comparing G2 counterfactual outcomes with the higher G1 baseline. As is apparent in the first column, halving annual baseline growth rates exacts a heavy toll on the economies of the Asian region, discounting real GDP by between 25% and 50% by 2030.

The effects of adverse energy shocks and policy regimes are as expected from the previous results. In no case do remedial policies achieve aggregate growth benefits that could compensate for 50% lower baseline, but it should be noted that countries with relatively low skill development per capita will enjoy the largest offsets against lower regional growth. Bangladesh, Indonesia, Lao People's Democratic Republic, Sri Lanka, and Pakistan all offset a large fraction of their growth disadvantage. Meanwhile, countries with significant agrofood potential, such as Indonesia, Thailand, the Philippines, also find substantial growth insurance in the policy package considered here.

VII. CONCLUSIONS AND POLICY IMPLICATIONS

The growth experience often referred to as the “Asian Miracle” has redefined the modern global economy with new models of international specialization and dramatically changed geographic patterns of production and trade. On the demand side, maturity of this regional growth experience has established new middle class markets in many Asian cities and even entire nations. Despite this rapid progress, however, Asian regional growth and prosperity remain works in progress. Significant poor populations exist in most countries and comprise majorities in many, and income inequality within and between many regional economies continues to increase.

If Asia can sustain two generations of positive growth trend, how can this growth be shared across populations within the region? This report examines this question, with focus on the emerging middle class in the ADB's DMCs. The general findings are optimistic, suggesting that Asia can continue and even accelerate established patterns of poverty reduction and livelihood advancement beyond poverty. For example, by a \$2-a-day PPP standard, Asia will move from 25% of the 2010 middle class to a majority (55%) in 2030. Even by a higher standard of \$4-a-day, Asia will represent 39% of global middle class income.

The first part of the estimation assessed the changing composition of national incomes across 22 Asian countries, assuming baseline growth rates at established consensus levels. The results suggest that over the next 20 years, about 1 billion people will be added to the 2.7 billion Asian middle class (based on \$2-a-day PPP standard). Depending mostly on initial conditions, the rate of change will be uneven across the region. The PRC and India will provide the largest number of additional middle class population, and this will reshape

regional and global markets in their image. At the same time, however, smaller countries will see faster or slower middle class emergence depending on the eligibility of their resource base and labor forces for recruitment into higher value added supply chains.

To a significant extent, the differences in the emergence of a middle class across Asia will then depend on external events and policy responses. The second half of this study examined the drivers of regional growth and change using a global forecasting model. The results are consistent with other previous studies in suggesting that energy price vulnerability is a critical risk to regional growth. The study also sheds light on how energy efficiency measures can provide insurance against this risk. Agricultural productivity growth, which can improve both the incomes of the rural poor Asian majority and the purchasing power of urbanites, was also considered. Policies that reduce both energy and food costs, saving households and enterprises money, can be a potent source of new demand and job creation.

Finally, in light of the importance of labor resources to the Asian growth experience, developing skills across the lower income regional economies is considered. The basic finding supports the view that this is the most critical prerequisite for realizing the vast economic potential of the Asian region. Higher incomes, a larger middle class, and the self-sustaining prosperity they generate, can only be built on the foundation of a skilled and productive labor force that captures significant value added and channels this into sustained long term expenditure, saving, and investment.

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