

Tobacco Control, Human Capital, and High-Quality Development: Implications for China and Other Countries in Demographic Transition

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Abstract

Background

Tobacco control has long been recognized as one of the most cost-effective public health interventions, with extensive evidence demonstrating its effectiveness in reducing tobacco use, preventing premature mortality, and lowering healthcare expenditures. However, comparatively little attention has been given to the broader mechanisms through which tobacco control may contribute to long-term economic growth, particularly in countries like China that are in demographic transition.

Methods

This paper develops a conceptual framework linking tobacco control to the principal determinants of long-run economic growth. Drawing on a broad review of the literature in economics, public health, and demographic research - together with reports from major international organizations - the framework synthesizes evidence on the pathways through which tobacco control, and tobacco taxation in particular, may influence human capital, labour supply, physical capital accumulation, fiscal sustainability, and total factor productivity.

Findings

The review indicates that the economic benefits of tobacco control extend well beyond reductions in healthcare costs and smoking-attributable mortality. Tobacco control contributes to economic development through multiple reinforcing mechanisms, including through healthy ageing and longer working lives, improved labour-force participation and productivity, enhanced human capital formation, improved reproductive health, and even stronger household savings and investment.

Tobacco taxation provides an additional macroeconomic dividend by generating sustainable government revenue, expanding fiscal space, and supporting productive public investment. These channels become increasingly important

as demographic ageing reduces the contribution of labour-force growth to economic expansion.

Conclusions

Demographic transition serves to reinforce the economic rationale for tobacco control. As countries shift from growth driven primarily by labour-force expansion toward growth increasingly dependent on productivity and human capital, tobacco control should be viewed not only as a public health intervention but also as an investment in long-term development. China and many other ‘high tobacco burden’ countries should be especially mindful of the economic and fiscal challenges posed by their ageing populations, as well as the important role tobacco control can play to confront them.

1. Introduction

It has been firmly established that tobacco use is detrimental to both population health and sustainable development. Globally, the economic cost of smoking has been quantified at 1.8% of GDP per year.¹ Recognition of these enormous health and economic costs has prompted an unprecedented international response, most notably through the WHO Framework Convention on Tobacco Control (FCTC), which now has 183 Parties and is among the most widely adopted treaties in United Nations history.²

The importance of tobacco control has also been recognized in the 2030 Agenda for Sustainable Development. Sustainable Development Goal (SDG) 3.a calls upon countries to strengthen implementation of the FCTC,³ while the Third International Conference on Financing for Development highlighted that *“tobacco taxation can simultaneously reduce tobacco consumption, lower healthcare costs, and generate additional domestic resources for development”*.⁴⁻

⁵ The FCTC is notable for advancing demand-side policies that tackle different market failures associated with tobacco use. An example here is that the full societal cost of tobacco use is not adequately reflected (accounted for) in the retail price of tobacco products, thus providing the rationale for higher tobacco taxation.

A substantial body of evidence demonstrates that tobacco control policies, particularly excise taxation, produce significant public health benefits. In the United States, a 10% increase in tobacco taxes has been associated with a 1.5% decrease in respiratory cancers.⁶ In France, substantial increases in cigarette taxation between the mid-1990s and 2005 tripled real cigarette prices, while male lung cancer mortality declined by more than fifty percent during the same period.⁷⁻⁸ Global modelling studies further suggest that increasing cigarette excise taxes by one international dollar worldwide could reduce the number of smokers by approximately 65 million, avert around 15 million

smoking-attributable deaths, and generate significant additional revenues for public health and development spending.⁹

Beyond health outcomes, an extensive economic literature has examined the effects of tobacco control policies. However, this literature has largely concentrated on short-term or sector-specific outcomes. Much of the evidence evaluates how tobacco taxation influences smoking behaviour. For example, the Philippines' 'Sin Tax Reform' increased real cigarette prices by 154% between 2009 and 2021 and reduced smoking prevalence by 36%.¹⁰ Other studies examine sectoral impacts, such as employment in hospitality industries following smoke-free legislation, often addressing concerns raised by the tobacco industry. While these studies provide important evidence for policy evaluation, they reveal relatively little about how tobacco control influences the fundamental determinants of long-run economic growth.

The long-term growth perspective has become increasingly important as many countries undergo profound demographic transition characterized by declined fertility, increasing longevity, and rapid population ageing. For the first time in modern history, many economies face shrinking working-age populations alongside rising dependency ratios, placing increasing pressure on labour supply, pension systems, and healthcare financing.¹¹⁻¹² China is among the first 'high tobacco burden' developing countries to experience this demographic transition. According to United Nations projections, China's population aged 15–69 began declining around 2020 and is projected to contract by about 0.9% annually between 2025 and 2050, reversing decades of labour-force expansion.¹³

These demographic changes have profound macroeconomic implications. For example, approximately one-third of East Asia's remarkable economic growth since the 1960s has been attributed to favourable changes in age structure.¹⁴ As this demographic dividend fades, population ageing is expected to become

an increasingly important constraint on economic growth, contributing to the moderation in China's long-term growth projected by the IMF.^{11,15}

As labour-force expansion slows, future economic growth will depend increasingly on improvements in labour quality rather than labour quantity. This shift is consistent with endogenous growth theory, which identifies human capital accumulation as the principal engine of sustained long-run economic growth. Health is now widely recognised as a core component of human capital because it influences educational attainment, labour-force participation, productivity, innovation, and healthy ageing throughout the life course.¹⁶⁻¹⁷

This perspective has increasingly been adopted in health economics. WHO's Economic Projections of Illness and Cost (EPIC) model, for example, evaluates the macroeconomic benefits of health interventions through improvements in mortality, morbidity, labour supply, and human capital formation.¹⁸ The framework has recently been applied to estimate the long-run economic benefits of malaria elimination.¹⁹

This emphasis on human capital closely aligns with China's evolving development strategy. In May 2023, President Xi Jinping emphasized that *“population development is a major issue related to the great rejuvenation of the Chinese nation”* calling for greater emphasis on improving population quality and supporting Chinese modernization through high-quality population development. This reflects China's broader transition from growth driven primarily by factor accumulation toward one increasingly dependent on productivity, innovation, and human capital.

Tobacco control assumes a much broader economic significance within this framework. Tobacco use is not merely a health risk, it directly undermines the accumulation and preservation of human capital throughout the life course. According to estimates from the Institute for Health Metrics and Evaluation, tobacco use accounted for approximately 12.3% of all deaths globally in 2023

and 22.3% of deaths in China.²⁰ Tobacco use also imposes substantial fiscal costs, accounting for approximately 5.7% of global health expenditure and more than 10% in several high-burden countries.¹ Given the continued high prevalence of smoking in many developing countries, tobacco use is also likely to influence a wider range of economic outcomes beyond mortality and labour-force participation, including healthy ageing, household savings, investment, fiscal sustainability, and human capital accumulation.²¹

Despite these potentially far-reaching implications, relatively little research has examined tobacco control from the perspective of long-run economic growth. Existing studies predominantly focus on healthcare costs, mortality, or labour-force participation, while giving comparatively limited attention to the broader mechanisms through which tobacco control may influence productivity growth, healthy ageing, fiscal sustainability, capital accumulation, and ultimately the quality of economic development.

This paper addresses this gap by developing a conceptual framework linking tobacco control, particularly tobacco taxation, to the fundamental drivers of endogenous economic growth in ageing societies. Using China as the principal case study, we examine how tobacco control can contribute to high-quality development through multiple interconnected channels, including human capital accumulation, healthy ageing, fiscal sustainability, savings, and investment. Although China provides the primary empirical and policy context, the framework has broader relevance for many countries confronting similar demographic transitions and development challenges.

2. Conceptual framework

Unlike previous studies that primarily evaluate the health or short-term economic effects of tobacco control, this paper seeks to develop a conceptual framework that explains how tobacco control may influence the fundamental drivers of long-term economic growth, particularly in countries undergoing

demographic transition. Rather than undertaking a formal systematic review, our objective is to synthesize evidence across multiple disciplines - including health economics, public finance, macroeconomics, demography, and endogenous growth theory - to identify the principal pathways through which tobacco control may affect economic development.

To achieve this objective, we conducted a broad scoping review of relevant literature in recent decades using EconLit, EMBASE and PubMed, which was then supplemented by searches of specialist journals and reports published by United Nations and international development organizations (including the International Monetary Fund, the World Bank, and the World Health Organization). Relevant working papers and other grey literature sources were also identified through targeted Google searches. The evidence was reviewed to identify recurring mechanisms linking tobacco use and tobacco control to population health, human capital accumulation, fiscal sustainability, demographic change, and long-run economic performance.

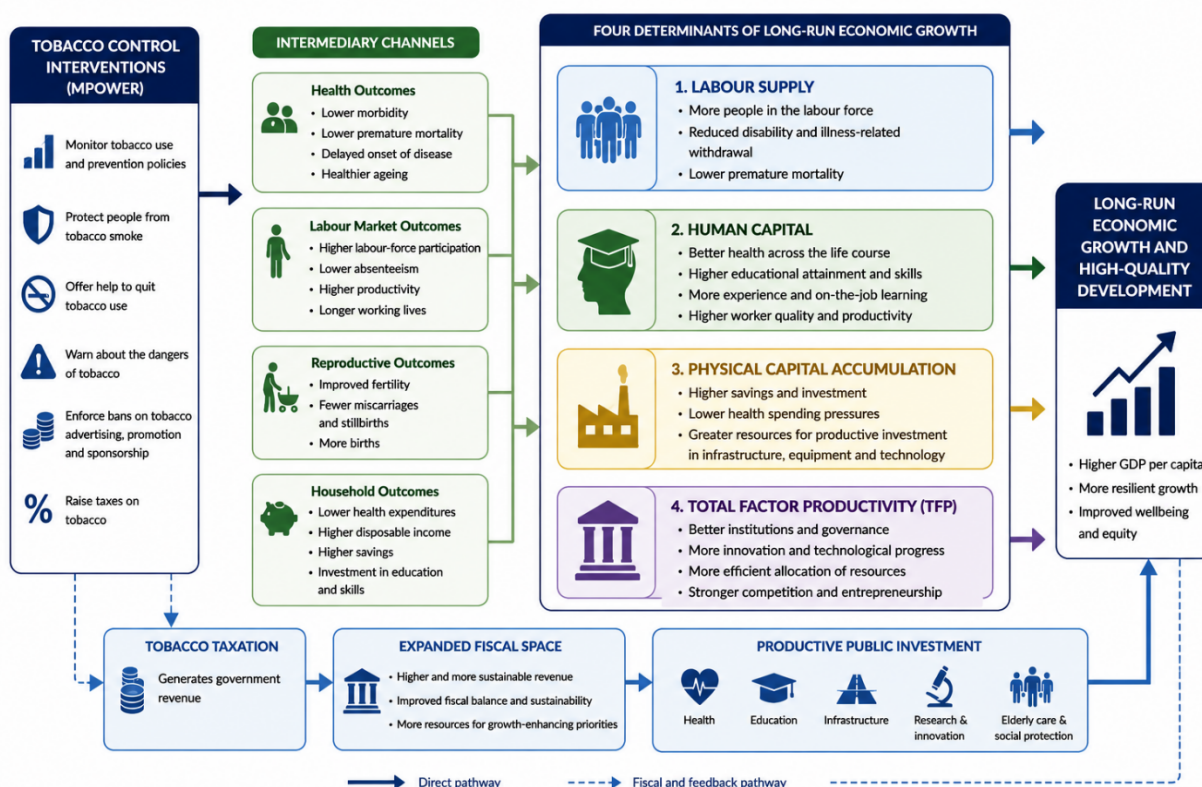
Drawing on this evidence, we developed a conceptual framework presented in Figure 1, which integrates insights from endogenous growth theory with the expanding literature on health, human capital, and economic development. The framework illustrates how tobacco control may influence long-term growth through multiple interconnected channels, extending beyond the well-established effects on mortality and morbidity to encompass healthy ageing, labour-force participation, productivity, savings, investment, and fiscal capacity.

The framework distinguishes between two complementary policy mechanisms. The first comprises the six evidence-based tobacco control measures recommended under WHO's MPOWER package. These measures primarily reduce tobacco consumption by lowering smoking initiation, encouraging cessation, and reducing exposure to second-hand smoke.²² The second mechanism is tobacco taxation, which occupies a unique position within the

framework. Beyond its role as one of the most effective tobacco control interventions, taxation generates substantial government revenue that can strengthen fiscal sustainability, create fiscal space for productive public investment, and support greater investment in health, education, and other forms of human capital. Consequently, tobacco taxation influences long-term economic growth through both behavioural and fiscal channels, making it a particularly important policy instrument in ageing societies.

Ultimately, the framework proposes that the contribution of tobacco control to economic development extends well beyond improvements in population health. Large demographic changes like aging tends to shift the primary constraint on economic growth from labour quantity to labour quality. In turn, tobacco control increasingly functions as an investment in human capital and healthy ageing, while tobacco taxation provides governments with additional fiscal resources to support productivity-enhancing investments. Together, we argue that these mechanisms position tobacco control as an integral component of a broader strategy for promoting sustainable, high-quality economic growth.

Figure 1. Tobacco control and determinants of economic growth



3. Economic growth and human capital

Understanding how tobacco control influences long-term economic development requires first considering the principal determinants of economic growth. The foundations of modern growth theory can be traced back to the pioneering work of Robert Solow and Trevor Swan during the 1950s, which explains economic growth through the accumulation of labour and physical capital, together with productivity improvements arising from technological progress.²³⁻²⁴ A central insight of Solow–Swan model is that capital accumulation alone cannot sustain long-run growth because diminishing marginal returns eventually reduce the contribution of additional capital. Sustained improvements in income and living standards therefore depend ultimately on continued growth in productivity.

While highly influential, the Solow-Swan framework treats technological progress as exogenous, offering limited explanation for why productivity improves over time. This limitation motivated the development of endogenous growth theory during the 1980s, particularly through the contributions of Robert Lucas and Paul Romer.²⁵⁻²⁷ In contrast to neoclassical models, endogenous growth theory argues that productive growth arises from deliberate investments that expand the productive capacity of individuals and societies. Human capital accumulation, including education, knowledge, skills, innovation, and health, therefore becomes the central engine of sustained long-run economic growth.

Although early endogenous growth models focused primarily on education and skills, subsequent research has increasingly recognized health as an equal fundamental component of human capital.^{16,28,29} Healthy individuals participate more actively in the labour force, accumulate greater educational attainment, are more productive throughout their working lives, and remain economically active for longer. Modern definitions of human capital therefore encompass health alongside education, training, experience, and knowledge.^{17,30} From this perspective, health should be regarded not merely as a desirable social outcome of economic development, but as a productive asset that directly contributes to productivity growth and long-term economic growth.

The economic importance of health becomes even greater during demographic transition. For much of the twentieth century, many countries benefited from expanding working-age populations that contributed directly to economic growth through increases in labour supply. As fertility declines and populations age, however, this demographic dividend gradually disappears. Future economic growth increasingly depends not on expanding the quantity of labour, but on improving its quality, that is, maintaining a healthier, more productive, and longer-working labour force. Investments that promote healthy

ageing, preserve human capital, and extend productive working lives therefore become increasingly important determinants of long-run growth.

Within this context, tobacco control assumes a broader economic significance. Beyond reducing healthcare costs and premature mortality, effective tobacco control policies help preserve and enhance human capital by improving population health across the life course, extending productive labour-force participation, and supporting healthy ageing. As economies transition toward growth driven primarily by productivity rather than labour-force expansion, these human capital effects position tobacco control as an increasingly important investment in long-term economic development rather than solely a public health intervention.

4. Tobacco control and the determinants of economic growth

Consistent with endogenous growth theory, Figure 1 identifies four interrelated determinants of long-run economic growth: labour supply, human capital, physical capital accumulation, and total factor productivity (TFP). Although conceptually distinct, these determinants reinforce one another and collectively determine an economy's long-run productive capacity. Tobacco control influences each through multiple behavioural, demographic, and fiscal pathways, extending well beyond its well-established effects on mortality and healthcare expenditure.

Among these determinants, human capital occupies a central position. Improvements in population health increase labour-force participation, enhance educational attainment and productivity, support healthy ageing, and strengthen the accumulation of knowledge and skills throughout the life course. At the same time, healthier populations contribute to greater household savings, stronger public finances, and higher levels of productive investment, thereby reinforcing physical capital accumulation. These improvements ultimately translate into higher Total Factor Productivity

through more efficient allocation of labour and capital, greater innovation, and stronger institutional performance.

Tobacco taxation occupies a distinctive position within this framework because it generates additional tax revenue while also improving population health. Consequently, tobacco taxation promotes long-run growth through two complementary channels: by preserving human capital through reduced tobacco consumption, and by strengthening fiscal sustainability and expanding fiscal space for productive public investment.

Taken together, these mechanisms suggest that tobacco control should be viewed not merely as a public health intervention but as an investment in the productive capacity of the economy. This perspective becomes increasingly important for countries undergoing demographic transition, where slowing labour-force growth shifts the principal source of expansion from labour quantity toward labour quality, productivity, and innovation.

4.1 Human capital accumulation

Human capital represents the primary mechanism through which tobacco control contributes to long-run economic growth. Within endogenous growth theory, sustained increases in productivity arise from investments that improve the quality of the labour force rather than simply expanding its size. Health therefore constitutes a productive asset that enhances educational attainment, cognitive development, labour-force participation, innovation, and productivity throughout the life course.

As population decline and ageing reduces the contribution of labour-force expansion to economic growth, preserving and enhancing human capital becomes increasingly important. In ageing societies, economic performance depends less on adding new workers and more on maintaining a healthier, more productive, and longer-working labour force. Tobacco control contributes directly to this objective by reducing premature mortality, preventing disability,

delaying the onset of chronic disease, and supporting healthy ageing. Within this broader human capital framework, three closely related pathways are particularly important: labour supply and labour-force participation, healthy ageing, and fertility.

4.1.1 Labor supply and labour-force participation

Labour supply represents the most immediate pathway through which tobacco control affects economic performance. Tobacco-related diseases reduce the effective labour force through premature mortality, disability, illness-related absenteeism, presenteeism, and early retirement. Conversely, tobacco control increases the number of healthy individuals able to participate productively in the workforce throughout their working lives.

Globally, IHME estimates that two-thirds of all Disability Adjusted Life Years (DALYs) from tobacco-related diseases are borne by adults in the 15-69 working-age cohort.²⁰ On the other hand, many adults who quit smoking can gain almost a decade in life expectancy, and even those who quit in their 50s can gain more than five-years in life expectancy.³¹ The convention in many economic assessments like the EPIC model is to quantify the labour impact of diseases or conditions in terms of the number of Years Lost to Disability (YLDs) on the assumption that each YLD this is equivalent to a year of lost productivity.^{19,32} In other words, YLDs largely represent the impact of a disease or ill-health on employment at the extensive margin.

One recent study used Computable General Equilibrium (CGE) modelling to assess the impact of tobacco control on economic growth in India.³³ Note CGE models differentiate themselves from other economic analyses in that they allow the factors of production in one sector, such as tobacco production, to be re-allocated to others in response to shocks or interventions. This particular CGE study highlighted the importance of the labour supply as a key channel for impacting long-term growth. The authors initially found that reducing tobacco use by 10% would result in a small reduction of 0.14% in overall GDP

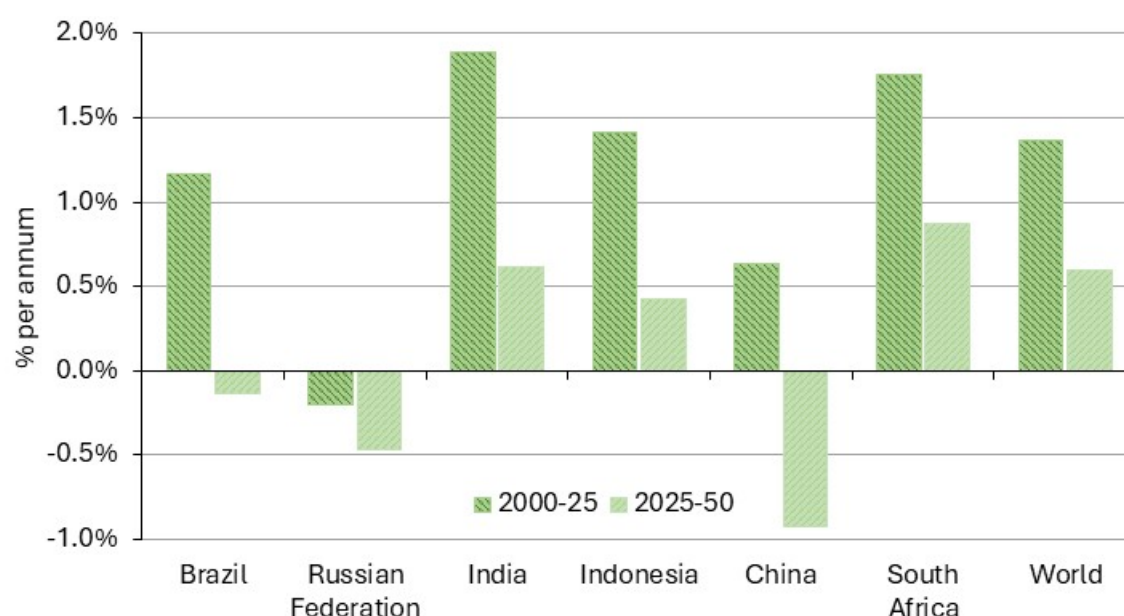
due to the tobacco sector being highly profitable in a financial sense. However, the outcome became positive at 0.22% of national GDP once the impact on the labour force - via fewer deaths among the working-age population - was incorporated into the analysis.³³

Another recent paper applied a health-augmented macroeconomic model similar to WHO EPIC to assess the potential impact of higher tobacco taxes and prices in China.³⁴ This research found that a 20% increase in tobacco product prices due to taxation would avert some 86,000 smoking-attributable deaths each year and ultimately translate into economic gains equivalent to 0.43% of China's annual GDP.³⁴ Another recent paper using Generalized Method of Moments (GMM) regression analyses on a sample of 38 Africa countries found that tobacco taxation enhances growth primary through its effect on population health, with a 0.21 to 0.36 percentage points increase in long-term growth.³⁵

The same health-augmented model described for China above was used to assess the potential economic impact of implementing a national smoke-free law, with the finding that this policy alone could increase national GDP by 0.04%-0.07%.³⁶

As discussed, the size of an economy's labour force has become especially relevant now that the working-age population of many developing countries will start to decline. Figure 2 illustrates the situation across the BRICS, with China in particular expected to experience a reversal of some 1.5% percentage points in working-age population growth. Specifically, China's working-age population increased on average by 0.6% per annum over 2000 to 2025, but is projected to decrease on average by -0.9% per annum through to 2050.¹³

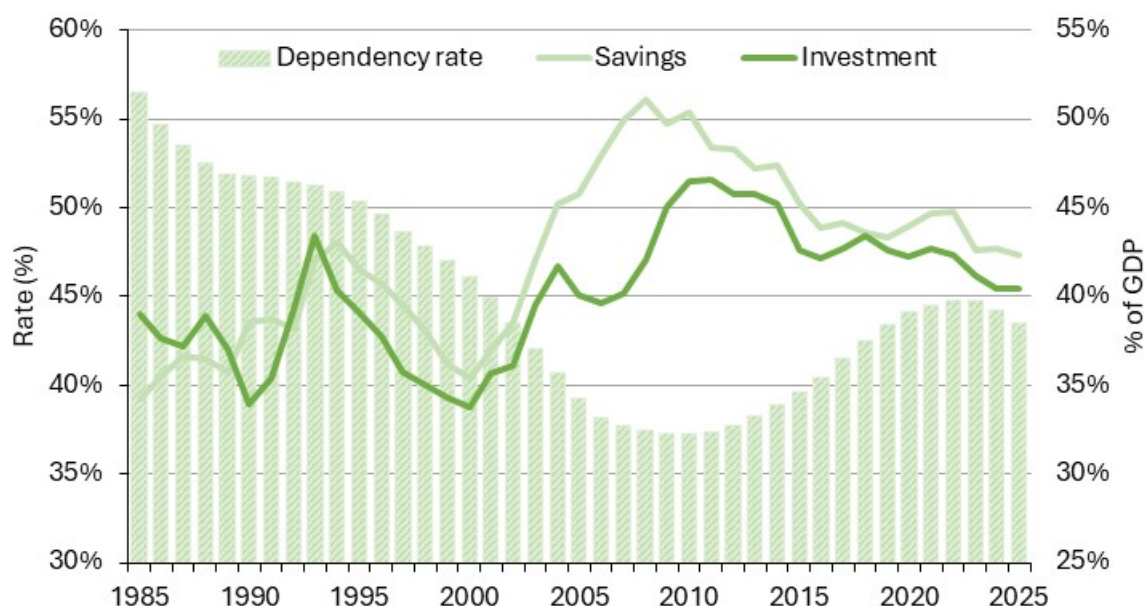
Figure 2. Annual average growth rates in working-age populations



Historically, China's record of population growth has underpinned a sustained expansion in growth, with real GDP averaging 8% per annum between 2000 and 2025.¹¹ Simplistically, the expected contraction in China's working-age population implies that GDP growth could slow to around 6% per annum through to 2050. This observation is not meant as a forecast, but to highlight the significance of the 'demographic drag' now being faced by China and other countries as their populations age. Nonetheless, a recent IMF study has come to a similar conclusion about China's growth prospects - stating that China's potential growth has fallen from around 10% in 2006 to 5% in 2022.¹⁵ Another IMF study found that China's growth rate is expected to slow even further to around 3% by 2040.³⁷

Clearly, population growth was far from the only determinant of strong economic growth for China over the past two decades. Many other structural factors - like urbanization, manufacturing capacity, and trade openness - played a role. In particular, many studies highlight China's exceptionally strong increase in capital investment during the early 2000s (refer to investment as a percentage of GDP in Figure 3).

Figure 3. Savings, investment, and dependency rates in China, 1985 to 2025



Given the dynamics of modern economic growth theory, it is perhaps no coincidence that physical capital investment is also expected to slow in China in coming decades.³⁷ In turn, this reinforces the importance of human capital formation, including policies that help retain and support workers into late adulthood.¹⁰

These labour-market effects become particularly important in ageing economies. China's working-age population has already entered a period of sustained decline, reversing decades of demographic expansion that contributed substantially to rapid economic growth. As labour quantity becomes increasingly constrained, preserving the productivity and participation of each worker assumes much greater economic significance.

4.1.2 Health aging and human capital preservation

Beyond increasing labour-force participation, tobacco control contributes to economic growth by preserving the quality of human capital throughout the life course. Healthy ageing enables individuals to remain productive for longer, maintain cognitive function, reduce absenteeism, and delay disability. These

improvements become increasingly important as older workers account for a growing share of the labour force in ageing societies.

The concept of ‘healthy ageing’ closely aligns with the theory of morbidity compression, whereby disability and chronic disease are postponed to later stages of life, allowing individuals to enjoy longer periods of productive and independent living. Tobacco control represents one of the most important policy instruments for achieving this objective because smoking is a major risk factor for cardiovascular disease, respiratory disease, cancer, and cognitive decline.

It is generally accepted that workers in ‘good health’ will tend to be more productive than those suffering from NCDs or other health conditions. The negative impact of smoking on productivity was also nicely demonstrated in a 2013 National Health and Wellness Survey covering 20,000 adults from China, 75,000 adults from the United States, and 62,000 adults from the European Union.³⁸ In China, current smokers had 61% more absenteeism and 17% more overall work impairment than former smokers. Furthermore, excess absenteeism among smokers in China was far higher than in the United States and European Union at 28% and 18% respectively.³⁸

The fact that smoking is associated with additional or excess absenteeism is also well established in other countries, with several reviews having concluded that smoking is associated with a 30% increase in overall absenteeism.^{39,40} More crucially, the literature also shows that absenteeism can be reduced through cessation. Several studies on this relationship have found that productivity and absenteeism levels among adults who quit smoking tends towards those of ‘never smokers’ after roughly four years since quitting.³⁸⁻⁴¹ In China, it has been found that adults who quit within the last four years enjoyed a 22% reduction in absenteeism compared to adults who continued.³⁸

More recent studies have explored what appears to be significant improvements in the physical and cognitive abilities of individuals over the age of 50 years in many high income countries.^{12,42} One IMF study summarized this pattern succinctly in that *“people are not only living longer but are also ageing in better health, which is associated with longer and more productive working lives”*.⁴² The authors found the greatest gains occurred from improvements in mental function, with a decade of cumulative improvement in the cognitive capacity of individuals raising the likelihood of labour force participation by around 20 percentage points, hours worked by around 6 hours, labour productivity by around 30 percent, and annual earnings by around 35 percent.⁴²

The concept of healthy ageing is not new to the field of health economics either, but with this issue becoming ever more pertinent now that a growing proportion of the working-age population is falling between the ages of 50 to 64 years.¹¹ For example, adults aged 50-64 years old accounted for 15% of China’s working-age population in 2000. This proportion has risen to 27% in 2025 and is projected to increase to some 37% by 2050.¹³

As discussed, healthy aging shares common space with the demographic concept of morbidity compression in which the average age at onset of morbidity is postponed to later in life, thus compressing the period of time that individuals spend in a state of illness prior to death. This hypothesis was formulated by Frames Fries during the 1980s and reflects modern drivers like chronic disease prevention, improved living conditions, and healthier lifestyles.⁴³ Evidence fully supporting this hypothesis remains somewhat elusive, though it has been found that countries with lower death rates from cardiovascular and respiratory diseases have lower levels of disability compared to other countries.⁴⁴ Needless to say that tobacco use is a major risk factor for these diseases.

Unfortunately, evidence from IHME suggests the opposite has occurred in the context of tobacco use in China. Table 1 shows that the rate of disability (YLDs

per 100,000 people) from tobacco-related diseases has increased by 54% between 1990 and 2020.²⁰ This is in stark contrast with the ‘rest of the world’ where the rate of disability from tobacco has fallen by 9%. Similarly, the death rate from tobacco-related diseases has fallen by just 6% in China, compared to 27% in the rest of the world.²⁰

Table 1. Trends in the health burden of tobacco-related disease

	China	Rest of world	World
Disability (YLDs)	(Rate per 100,000)	(Rate per 100,000)	(Rate per 100,000)
1990	349	372	368
2020	536	339	376
% change	54%	-9%	2%
Deaths	(Rate per 100,000)	(Rate per 100,000)	(Rate per 100,000)
1990	151	99	111
2020	142	72	85
% change	-6%	-27%	-23%
Total burden (DALYs)	(Rate per 100,000)	(Rate per 100,000)	(Rate per 100,000)
1990	4,462	3,244	3,524
2020	3,555	2,145	2,411
% change	-20%	-34%	-32%
Tobacco as % of all causes	(% DALYs)	(% DALYs)	(% DALYs)
1990	11.6	6.2	6.9
2020	14.2	5.9	6.8

Table 1 also shows how the burden of disease from tobacco use has shifted over time using Disability Adjusted Life Years (or DALYs): a measure of aggregate health burden that combines life years lost due to disability and premature death from different diseases or risk-factors like tobacco use.²⁰ In 2020, tobacco use accounted for 14.2% of all DALYs in China, compared to just

5.9% of DALYs across the rest of the world. Overall, the health burden of tobacco use in China has increased markedly over time from 11.6% of all DALYs in 1990, while it has been suppressed in the rest of the world. Much of this difference can be attributed to an increase in rate of disability (or morbidity) from tobacco use in China.

Collectively, these findings suggest that tobacco control should be viewed not only as disease prevention, but also as an investment in preserving human capital and extending productive working lives.

4.1.3 Fertility and future human capital

Although fertility has traditionally been viewed as a demographic issue, it also represents a long-term determinant of human capital formation. Tobacco use adversely affects fertility, pregnancy outcomes and reproductive health thus, reducing the future supply of healthy workers. Consequently, tobacco control has the potential to complement broader demographic policies aimed at addressing population ageing and declining birth rates.

The link between tobacco use and fertility is firmly established in the scientific literature.⁴⁵ In economics, however, the link between fertility and economic growth is often seen as somewhat transitional reflecting broader changes in education levels, urbanization, and household childbearing intentions for example. However, there has been a renewed focus on fertility in many countries including as the number of women in childbearing age has begun to decline. China, for example, has recently announced a family subsidy designed to boost China's slowing birth rate.⁴⁶

The question of tobacco use and reproductive health was recently studied in the context of China by Li (2024).²¹ This detailed work found that - among married couples where the female is aged 20-49 years - active smoking contributes to 9.7 (C.I.95% 7.5-11.9) million unborn cases per year from infertility, miscarriage, and stillbirth. This is equivalent to 108% (C.I.95% 80-

130%) of the number of actual births in China at 9.02 million in 2023.¹⁷ The study also assessed the potential impact of achieving the *Healthy China 2030* strategy which aims to reduce the adult smoking rate to 20% by 2030, with the author finding that the number of unborn cases could be reduced by 2.51 (C.I.95% 1.9-3.1) million cases, or an increase of 27.7% (C.I. 95% 21.5%-34.1%) on actual births in China for 2023.²¹

To give these findings more perspective, Table 2 highlights the potential impact on births in China assuming median fertility rates predicted by the United Nation's is increased by 27.7% due to achievement of the *Health China 2030* strategy prevalence reduction target.¹³ Overall, there would be an increase of some 20 million births each decade from 2030 onwards, or about 2 million extra births per year.

Table 2. Potential impact of tobacco control on fertility and births post-2030

10-year intervals	Women aged 20-49 years (millions) ^a	Fertility rate: DESA Median (births/1,000)	Fertility rate: Healthy China (births/1,000) ^b	Births: DESA Median (millions)	Births: Healthy China (millions) ^b
2011-20	319	52.0	52.0	166	166
2021-30	200	37.9	37.9	76	76
2031-40	213	32.8	41.9	70	89
2041-50	230	33.0	42.2	76	97

^a Average population in this age cohort.

^b Assumes a 27.7% increase in the fertility rate due to the Healthy China 2030 prevalence reduction target being achieved.

While these extra births obviously wouldn't add to China's labour pool until 2050 onwards, it does highlight how tobacco control can combine with other interventions like subsidies for childbearing to achieve broader development objectives. In the context of the *Healthy China 2030* strategy, several studies have emphasized the need for China to implement just two key MPOWER policies – higher taxation and a national smoke-free law - to achieve the

targeted reduction in China's adult smoking rate by 2030.^{47,48} In this respect, President Xi published an important article on August 1 titled *Accelerating the Building of a Healthy China* in Qiushi Journal stressing that building a healthy China by 2035 is a strategic decision of the country and calling for coordinated planning and vigorous implementation to secure decisive progress.

Although improvements in fertility influence economic growth only over the longer term, they demonstrate that tobacco control contributes to both the quality and, potentially, the future quantity of human capital.

4.2 Savings, investment, and physical capital accumulation

In addition to preserving human capital, tobacco control may contribute to long-run growth by strengthening physical capital accumulation through higher savings and investment.

Healthier individuals typically remain economically active for longer, postpone retirement, and accumulate savings over a longer working life. Reduced expenditure on tobacco products and tobacco-related illness may further release household resources for education, housing, business investment, and other productive uses.

At the macroeconomic level, demographic research consistently demonstrates strong relationships between dependency ratios, household savings, and investment. China's rapid economic expansion was accompanied by exceptionally high saving and investment rates during a period of favourable demographic structure. As dependency ratios increase, maintaining these levels of capital accumulation will become progressively more challenging.

It may seem tangential at first glance to link tobacco control with investment. However, literature from both micro and macro-economics suggests that expectations about healthy aging may positively effect household savings, with individuals that remain in the workforce longer tending to 'draw down' on savings later in life.¹⁴ This is not just mere conjecture with studies exploring

this life-cycle effect often focusing on dependency levels or ratios between the core 15-64 working-age population and youth or elderly cohorts. A recent World Bank study of investment and savings in China, for example, confirmed this demographic relationship, with a 2 percentage point increase in the old age dependency ratio being associated with a 1 percentage point decrease in private savings.⁴⁹

Interestingly, expectations about healthy aging may also increase the return on investment from further education over an individual's life-course thereby contributing to human capital.¹⁴ It is pertinent to note also that tobacco use can have the opposite effect by displacing household expenditure on health and education.¹⁰ Indeed, a recent Household Consumption Expenditure Survey for India includes an alarming statistic that rural households now spend more on tobacco products than on education services. This undoubtedly reflects a tragic misallocation of household resources since education presents a clear pathway towards breaking the cycle of generational poverty.¹⁰

At the same time out-of-pocket expenditures on health often are, in fact, draw downs on household savings. While we couldn't find evidence directly linking tobacco use with savings rates over the life-course, it isn't a stretch to conclude such relationships at least in principle.

Returning to Figure 3, it is evident that there is a strong connection between savings and investment across the Chinese economy, with both having increased strongly in recent decades. There are a number of structural factors underpinning this pattern, with some arguing that historical gaps in China's social protection system and falling job security had pushed up levels of precautionary savings.⁵⁰ Nonetheless, Figure 3 illustrates the potential impact of demographics, with low point in dependency levels in China during 2010 being also associated with high levels of savings.¹¹

Another way of expressing this is that China has exhibited a high ‘marginal propensity to save’ compared to other countries.⁵⁰ A distinguishing feature for China is that the household, corporate and government sectors have each historically contributed to China’s national savings rate, with marginal propensities to save exceeding 50%.⁵⁰ This issue is not without relevance to other developing countries since evidence suggests that the impact of income taxes on household savings is much greater than that of consumption taxes. Therefore, a re-balancing of income and consumption taxes might rise household savings, with policy implications if this is a development objective.⁵¹ We focus on government savings and investment in the next section.

Although direct evidence linking tobacco control to national savings remains limited, healthier populations, lower healthcare expenditures, and longer productive working lives provide several plausible mechanisms through which tobacco control can strengthen physical capital accumulation over time.

4.3 Fiscal sustainability and productive public investment

Tobacco taxation occupies a unique position within the conceptual framework because it simultaneously improves public health and strengthens government finances.

On the expenditure side, reducing tobacco use lowers healthcare costs associated with smoking-related diseases, thereby easing fiscal pressures arising from chronic disease and population ageing. On the revenue side, higher tobacco taxes can generate substantial government revenues. Together, these effects improve fiscal sustainability and expand fiscal space for investments in health, education, scientific research, infrastructure, and other productivity-enhancing activities.

Numerous studies have emphasized the negative impact of NCDs on public finances.^{4,48} In terms of expenditure, it’s clear that tobacco use creates a strain on public health systems. For example, it has been estimated that diseases

caused by smoking account for 5.7% of global health expenditures, while in Russia and other Eastern European countries this burden can exceed 10%.¹ There have also been numerous studies in the context of China, with estimates suggesting that smoking accounts for around 3% of national health expenditures.⁵² Without being alarmist, the situation in Eastern European countries like Russia highlight the risk to other health systems around the world.

In contrast, a number of studies from high-income countries have noted how tobacco control can effectively bring down the healthcare cost of smoking. In France, for example, every euro invested in tobacco control has been estimated to return 4 euro in healthcare savings. In the US and Canada, tobacco control programmes have been estimated to yield a return of 8 to 10 respectively.⁵³

The combination of chronic disease within an aging population will present new challenges for many countries, with higher dependency ratios also placing a strain on public pension systems as well as healthcare.¹¹ A recent OECD study projects that the age structure of populations across the OECD group of countries will cause health spending to increase by 0.6% per year compared to increases of just 0.1% per year in government revenues.⁵⁴ This underscores the detrimental impact that population aging is expected to have on the primary balance of many government's, with implications for public saving, investment, and pro-growth spending.

Indeed, most countries are likely to face a worsening 'interest-growth' differential than in the past, with one recent IMF study concluding that many countries - notably China, Japan and the United States - will need to maintain higher primary balances than historically registered to keep debt ratios stable from 2030 onwards.¹¹ The authors point toward policies and interventions that promote healthy aging as a way to off-set these demographic headwinds.¹¹

The ‘win-win’ potential for tobacco taxes to create fiscal space while also curbing health costs has been highlighted in development forums for well over decade.^{3,5,9} Several recent studies have further emphasised the importance of health taxes given emerging fiscal constraints for many developing countries, including that Official Development Assistance (ODA) for the health sector is estimated to have fallen by 30% since 2023.⁵⁵⁻⁵⁶ Similarly, the high revenue generation potential of tobacco taxation has been demonstrated in practice across different country settings and situations. China’s last tax increase on cigarettes in 2015 confirms this win-win effect, with a 8% decrease in cigarette consumption and a 14% increase in tax revenues – representing an extra 15 billion USD per year.⁵⁷

More generally, the primary balance of many countries has deteriorated over the past decade, with the pandemic exacerbating matters further. China’s primary deficit has improved since 2020 but was still estimated at 8.2% of GDP in 2025 compared to a deficit of 3.7% of GDP across all developing countries.¹¹ Based on research published in the WHO Bulletin, doubling the retail price of cigarettes through taxation in China would generate around 150 USD billion extra per year in tax revenues.⁹ This extra revenue would represent about 1.2% of GDP and therefore make a meaningful contribution to fiscal consolidation. The same doubling of cigarette prices through taxation would reduce the primary deficit of all developing countries to about 2.9% of GDP - a 0.8% of GDP consolidation.⁹

Higher tobacco taxes can therefore make a measurable contribution on the fiscal position of many countries through both the revenue and expenditure side of the balance sheet. More generally, higher tobacco taxes would enable many countries to rebuild buffers and to create the fiscal space for pro-growth spending and investment. Consequently, tobacco taxation contributes to long-run growth not only through behavioural change, but also by increasing

governments' capacity to invest in the foundations of future economic development.

4.4 Total Factor Productivity and high-quality development

The combined effects of tobacco control on human capital, labour-force participation, physical capital accumulation, and fiscal sustainability ultimately converge through improvements in Total Factor Productivity (TFP). Healthier workers acquire skills more effectively, adapt more readily to technological change, remain productive later in life, and contribute more actively to innovation. At the same time, healthier populations reduce inefficiencies arising from disease, disability, and premature retirement, allowing labour and capital to be allocated more efficiently throughout the economy. These productivity gains are particularly relevant for China, where future economic growth is expected to rely increasingly on innovation, advanced manufacturing, digital transformation, and high-quality development rather than continued expansion of labour and capital inputs.

Viewed from this perspective, tobacco control should be regarded not simply as a health policy, but as an investment in the productive capacity of the economy itself. By preserving human capital, supporting physical capital accumulation, strengthening fiscal sustainability and enhancing Total Factor Productivity, tobacco control becomes an increasingly important component of long-run economic strategy in ageing societies.

5. Conclusion

This paper develops a conceptual framework linking tobacco control to the fundamental drivers of long-run economic growth in ageing societies. Drawing on insights from endogenous growth theory, health economics and demographic economics, it argues that the economic benefits of tobacco control extend well beyond reductions in smoking prevalence, healthcare expenditure, and premature mortality. Rather, tobacco control contributes to economic

development through multiple reinforcing channels, including the preservation of human capital, healthier and longer working lives, improvements in labour-force participation and productivity, stronger physical capital accumulation, enhanced fiscal sustainability, and ultimately higher total factor productivity.

The central proposition of this paper is that demographic transition fundamentally changes the economic rationale for tobacco control. During periods of rapid labour-force expansion, economic growth can be supported by increases in the quantity of labour. As fertility declines and populations age, however, this demographic dividend gradually disappears. Future growth increasingly depends on improving the quality of labour through investments in health, education, innovation, and human capital. Within this context, tobacco control should be viewed not only as a public health intervention, but also as an investment in the productive capacity of the economy.

China provides a particularly important illustration of this transition. Having entered a period of sustained population ageing and declining labour-force growth, China is shifting from a development model driven primarily by factor accumulation toward one increasingly dependent on productivity, innovation, and high-quality development. This transformation creates a unique policy opportunity to integrate tobacco control more explicitly into China's broader economic development strategy. Comprehensive implementation of WHO's MPOWER measures - particularly substantial increases in tobacco taxation and the adoption of a national comprehensive smoke-free law - would not only accelerate progress toward the *Healthy China 2030* targets but could also strengthen the long-term foundations of economic growth by preserving human capital, promoting healthy ageing, and supporting labour productivity.

Among these policy instruments, tobacco taxation occupies a particularly strategic position because it generates a dual dividend. By discouraging tobacco consumption, it improves population health and reduces the burden of non-communicable diseases. At the same time, it generates substantial and

sustainable government revenue that can strengthen fiscal sustainability and expand fiscal space for investments in health, education, research and development, elderly care, and other productivity-enhancing public goods. The same logic applies to taxes on other unhealthy consumer products like alcohol and sugary drinks.⁵⁸ As many countries face increasing fiscal pressures arising from population ageing, rising healthcare costs, and slower economic growth, these fiscal benefits become progressively more important.

The strategic importance of these linkages is likely to become even more pronounced during *China's 15th Five-Year Plan (2026–2030)*, which is expected to place greater emphasis on high-quality population development, healthy ageing, technological innovation, and the cultivation of new drivers of economic growth. Positioning tobacco control within this broader policy agenda would align public health objectives with China's long-term economic strategy, reinforcing the principle that investing in population health is also an investment in national productivity and future prosperity.

Although China provides the principal focus of this paper, the conceptual framework has broader relevance for many middle-income and emerging economies undergoing similar demographic transitions. As labour-force growth slows across much of the world, sustained economic development will increasingly depend on preserving human capital, extending healthy working lives, and improving productivity rather than expanding the size of the workforce. Under these circumstances, tobacco control should no longer be regarded solely as a health policy. It should also be recognized as an integral component of long-term economic development strategy, one that simultaneously advances healthier populations, stronger public finances, and more sustainable economic growth.

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