

**The evolution of wealth-income ratios in India
1860-2012**

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World Inequality Lab

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Abstract

This article is about the metamorphoses of aggregate Indian wealth over fifteen politically transformative decades. Based on a comprehensive new database, I find that wealth-income ratios have fluctuated by large margins in the twentieth century. In emerging India of the twenty first century, wealth is steadily approaching the same disproportionate size (relative to national income) that was seen during sharp economic downturns in interwar colonial India. The long run 1939-2012 U shaped trajectories of wealth-income ratios are reasonably explained by a mid century asset price slowdown and the return of high land shares in national wealth. These results corroborate the secular increase of wealth-income ratios in most large economies since the 1980s. The manifestation of this phenomena appears to be independent of the stage of development.

JEL Classification: E10, D30, D31

Keywords: India, Economic growth, Wealth-Income ratio, National wealth, Inequality, Land values

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†**Link to the latest version of this article, online appendix and supplementary materials.**

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1 Introduction

The motivation for this article is the following: as an economy progresses through stages of development, how does the size of aggregate wealth change relative to national income? In pre-industrial societies it was possible to imagine vast hoards of wealth in the form of conquered land and gold despite lack of economic dynamism. The promise of capitalist growth on the other hand was ambiguous. While in theory one expected society to use its wealth efficiently to produce more output, the early economic thinkers were skeptics. In the view of Ricardo and Marx, even capitalism would be challenged¹ by the inexorable tendency for wealth accumulation to outstrip economic growth.

What we know now is that wealth-income ratios are limited by parameters such as growth (g) and saving (s), but they do in fact have a tendency to be very large. Piketty and Zucman (2014) used evidence from rich economies² to show that the relationship between aggregate wealth and national income agrees well with Solow's one good model (Solow, 1956). In the long run (almost three centuries), wealth-income ratios ($\beta = W/Y$) gravitated around the ratio s/g . Historically, this meant $\beta \approx 500-600\%$ based on $s=10\%$ and $g=1.5-2\%$. The only exceptions were during the period 1910-70 because of large shocks such as World Wars and unprecedented demographic expansion. With growth slowdowns since 1980 in most mature economies, wealth-income ratios seem to be returning to their historic values again.

This article systematically constructs new series to study wealth-income ratios in India; an economy that was (and still is) markedly different in structure and stage of development. I cover three defining periods of India's history over the years 1860-2012. These include British colonial rule (until 1947), the 1950-80 planning experiment right after independence and the post 1980 decades under pro-business and pro-market economic policies. Of special interest are the consequences

¹ Ricardo and Marx posited different mechanisms. The former argued that due to concentrated ownership of limited assets (such as land), the expansion of production and population growth could create disproportionate wealth via capitalized rents for landlords. According to Marx, while all wealth was ultimately created by labor, the competition for higher rates of return would push capitalists to replace labor and accumulate very large capital ultimately leading to the type of singularities he envisioned as turbulent revolutions

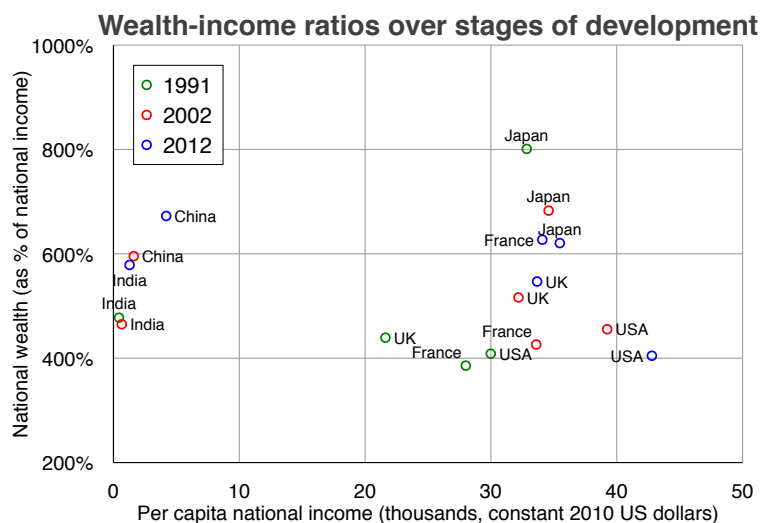
²The case of Sweden, a smaller rich economy are actually different due to Stolper-Samuelson type effects and a strong welfare system. See Waldenström (2017)

of the land puzzle in India; despite shifts in the savings-growth profile, Indians continue to retain strong preferences³ for land across the wealth distribution (Subramanian and Jayaraj, 2006). The importance of land can recur at different stages of development and thus potentially be a source of fluctuations in wealth-income ratios. For example, this holds for Spain (Artola et al., 2017) on either end of the 20th century. In the very long run (1210-2013), Britain's wealth-income ratios were strongly determined by fluctuations in land values (Madsen, 2019).

The underlying series were developed using historical studies, official surveys and national accounts consistent with methods and definitions outlined in the UN System of National Accounts (SNA) as well as the World Inequality Database (WID). To the best of my knowledge this is the first attempt that constructs and analyzes India's aggregate wealth-income ratio over such an extended period. These sparse data have obvious imperfections and serve purely as a lower limit to what we know about Indian wealth. But they mobilize the best sources at hand and are essential to answering key questions vis-a-vis wealth accumulation, inequality and growth over the development process. 18% of Earth's population lives in India, having democratized at a much lower level of per-capita incomes than nearly any other large country. Its history is peppered with structural shifts and a changing global importance that should shed more light on the evolution of wealth. These include but are not limited to: colonial policies, a U shaped share of global output in the 20th century, large scale nationalizations and the return of its industrialist class.

According to the findings of this research, in both the 21st century and interwar colonial period, Indian wealth became as large as 600-700% of national income. Strikingly, these large wealth-income ratios have persisted despite radically different economic environments. The high ratio in the interwar years was primarily due to an output collapse; the saving rate was only around 3-4%. In the 21st century, high ratios emerged under very rapid economic growth with substantial capital accumulation ($s=20-24\%$). The role of relative asset prices is fundamental, explaining to a great extent why the evolution of wealth relative to national income follows a U shape between 1939-2012. The intermediate period (1939-80) was characterized by rising consumer price inflation and a directed industrialization which may have curtailed the relative appreciation of land prices.

³See for example Badarinza et al. (2016) who note that financial assets are dominated by preferences for real estate across the wealth-distribution according to 2012 survey data.



Wealth-income ratios for other economies from World Inequality Database (wid.world). Per-capita incomes downloaded from World Bank Open Database (data.worldbank.org)

Figure 1: Wealth-income ratios in large economies 1991-2012

The recent evolution of wealth in India has both similarities and differences with results from other countries. What seems to appear certain is that wealth-income ratios can acquire high values independent of the stage of development (Figure 1). In rich countries this may be due to a recovery of asset prices and demographic slowdown (higher s/g). Consequently with slow growth in the West, the search for safe assets may be driving up non-reproducible asset prices in emerging markets (Caballero, 2006) such as China⁴ and India. This is most evident in cities such as New Delhi, Mumbai and Bangalore where real estate prices rival those of the world's major metropolitan cities. Such developments may be salient for wealth inequality because India shares many commonalities with the “cheap privatizations” of China and Russia (Chancel et al., 2018) since the early 1990s. Wealth and income inequalities have risen in the latter two economies, concurrent with rising wealth-income ratios. While we know that the one-good Solow type process could lead to equitable wealth distributions due to Stiglitz (1969), it is less likely⁵ in multi-good models. The ascent of wealth due to capital gains would *probabilistically* benefit those who already own such assets as opposed to new wealth accumulated from rising per-capita incomes as part of a dual-sector growth process.

⁴See Piketty et al. (2017) for the Chinese wealth-income ratio

⁵In fact the Solow growth model with land usually generates unstable asset bubbles (Nichols, 1970)

The remainder of this article is organized as follows: I discuss the core concepts and data used to construct the main series in the next section. In section 3, I present key results, decompositions and the changing structure of national wealth. The last section concludes. This article is supplemented with an appendix attachment.

1.1 Brief background

Indian economic history is steeped in controversial debates. Given that this article deals with (and sweeps across) a large chunk of time, a brief history will help for context. While the main debates⁶ can be found elsewhere, there are sufficient stylized facts on which most agree. According to Maddison (2001), India's share of global GDP fell from 6% to around 3.8% between 1870 and 1952. By 2012, the IMF⁷ estimated this share to have returned to nearly 6%. The British Crown inherited administrative control from the East India Company in 1858 and ruled for almost nine decades (i.e till 1947). Over this period, real growth rates of national income⁸ averaged 1.5-1.8% (1860-1947) which in the long run is not too far from Japanese or American rates of 1.5-3% in the late nineteenth century. However, India remained predominantly agrarian throughout and per-capita growth rates were in fact erratic due to demographic dynamics through the entire period. While population growth averaged less than 0.5-1% between 1860-1914, there was a noticeable mortality decline (Guha, 1991) which drove up population growth after 1921.

What these estimates then suggest is slightly increasing per-capita incomes until 1914 and a stagnation for the remaining colonial period; roughly 0.1% per-capita income growth. This economic decline was at the center of the underdevelopment thesis of nationalist economic writers. The crucial patterns under these aggregate statistics are the differential performance between

⁶The bulk of the controversy relates to the causes (British or internal) behind underdevelopment at the end of the colonial period. The origin of the debate can be traced to the nationalist writer Dadabhai Naoroji's "drain" theory (Naoroji, 1901) which claimed the British were expropriating Indian wealth through taxation. While scholarly attitudes towards colonialism have tempered down, the core of the discourse continues to be actively debated. A recent example is Mukherjee (2008) versus Roy (2016). For detailed studies in Indian economic history, the interested reader may refer to the original Cambridge Economic History of India (Kumar and Desai, 1983), and recent volumes such as Roy (2011) or Tomlinson (2013)

⁷IMF DataMapper - World Economic Outlook

⁸From Heston (1983) and Sivasubramonian (2000)

agriculture and private industry. The growth of agricultural GDP was only around 15% between 1900-46 (Roy, 2006) and its employment of 70% of the workforce implied low wages and poverty for all associated labor. On the other hand, as Roy (2016) claims, non-agricultural output (real) nearly doubled and industry cultivated foreign markets and imported skilled labor. Factory output was growing at a gross rate of 4-5%. This secondary sector improvement stood in contrast to the century long de-industrialization that India had experienced during Company rule until the mid nineteenth century (Clingsmith and Williamson, 2008).

Whatever the causal impact of British rule on under-development, at the time of independence India was dependent on agriculture, had substantial social and economic inequalities and its early political class cultivated a mistrust⁹ of private business. The first prime minister of India, Jawaharlal Nehru, hired technocrats to *plan* economic development. Through 1950-75, successive governments continued on a path of nationalizations of key sectors. These included air and rail transport, banking, coal and public utilities. Redistributive policies were passed and the rich were brought under the spheres of progressive estate, wealth and income taxations. Corporate taxes were high and licensing was employed to ration the role of the private sector.

Despite these explicit measures to take control of the development process, the state was unable to deliver substantial rates of economic growth. Compared to other Asian economies, India's low growth between 1950-80 became known as the "Hindu rate of growth." In understanding the shift towards much better subsequent macroeconomic performance, Rodrik and Subramanian (2005) cited the change in political attitude towards private business as the most important distinguishing factor. The electoral rhetoric shifted from distributive justice to economic growth (Kohli, 2006). It is in this new environment of incorporating private capital, opening up markets (after reforms in 1991-92) and reverse nationalizations that India began to show very high rates of economic growth. Around 2012, GDP growth rates averaged almost 8%. Whether growth was by its very nature disequalizing, or due to diminished focus on redistribution, this phase is also

⁹India's leading industrialists gave an economic outline in the 1945 "Bombay Plan." While Nehru (the first Indian Prime Minister) had mixed feelings towards the importance of private industry, it is generally agreed that India's first two five year plans were de-facto adoptions of the Bombay Plan. Economic historians have identified this development in two ways. (1) It was the best way for industrialists to protect themselves from global competition and (2) Building domestic industrial strength was a reaction to the foreign *laissez faire* type operations which nationalists identified as diffusing underdevelopment in British India. See Roy (2016)

associated with increasing inequalities. Chancel et al. (2018) found a return of high top income shares in 21st century India while wealth inequality also appears to be highest since 1991 (Anand and Thampi, 2016).

The analysis of trends in aggregate wealth versus national income has the distinct advantage of threading through the aforementioned types of structural changes. While modes and relations of production change over time, the idea of wealth accumulation remains and determines to a great extent how society organizes its production process. Crucially, and despite numerous changes, India inherently remains a wealth based society where class determines social mobility and the caste system reinforces hereditary professions. Extreme poverty and riches exist within the same framework. The goal of this research is not simply to explain persistent factors¹⁰ but rather to engage with, and analyze, these *ever-presents* (wealth, income, capital accumulation, economic growth) through evolving modern Indian history.

2 Data and conceptual notes

2.1 Sources

I use standard concepts outlined in the UN SNA framework to compile a comprehensive digital dataset of Indian wealth and national incomes in the long run. My construction framework closely follows attempts to similarly aggregate long run national balance sheets on a cross country basis by Goldsmith (1985) and Piketty and Zucman (2014). The main challenge is that no unifying source exists to combine and estimate India's national wealth. There is to date no official tradition of compiling national balance sheets, outside of a few dispersed sectoral accounts of assets and liabilities. This stands in contrast to attempts by Atkinson (1902) and Goldsmith (1983) who were responding to important debates¹¹ by developing highly detailed historical balance sheets. For flows in the post 1950 period, I use official national accounts for all net-of-depreciation flows i.e national income, capital formation, capital transfers, foreign investment at current prices. For

¹⁰Authors have engaged on such persistencies in recent years. The best example connecting independent India's economic potential to colonial systems is perhaps Banerjee and Iyer (2005)

¹¹Atkinson was part of the national income debate in the late nineteenth-early twentieth century while Goldsmith and Gerschenkron were deeply engaged in the financialization-development debates.

historical flows of output, income and saving I collected data from Sivasubramonian (2000) and Maddison (1992). Nominal variables are adjusted when appropriate using the national income deflator at 2012 prices.

For wealth estimates, I combine official capital stock figures from the Central Statistical Organization (CSO) and land values from nationally representative¹² surveys. All available post 1950 estimates of land values exclude the government and corporate sector's holdings. I adjust for these by adding 2% to the value of land owned by households. This figure was taken as an assumption based on estimates from 2012-14 asset disclosures of corporations and public entities. Needless to say, at this point all land changes are determined effectively by household's holdings. It is expected that in the future, these disclosures will allow the estimates of the full land component of national wealth. For pre-1960 estimates of national wealth, I draw upon the homogenous balance sheets attempted from multiple sources in Goldsmith (1983). Following SNA guidelines, consumer durables are excluded from net-of-depreciation fixed assets. Foreign balances are taken from the extended and updated dataset associated with Lane and Milesi-Ferretti (2007). Public sector balance sheets - i.e the net wealth of administrative government, full and partially controlled public enterprises - are impossible to complete due to limited disclosures. However I provide elements of the public balance sheet such as capital outlays (cash flow basis), capital stock at current prices and public debt¹³ (internal and external). These information were collected from the government's disclosures to the Comptroller & Auditor General of India (CAG) as well as annual statements of assets and liabilities which are part of union budgets of the Central Government of India.

Complete series (1950 onwards) of public sector savings are provided, computed using capital finance sections of the official national accounts. These sections allow a full breakdown of the national saving rate into public and private saving; something which is otherwise impossible using purely official tabulations of the national accounts. Demographic data are taken from the World Bank Open Database and stock market series (market capitalization, price indices) were

¹²The National Sample Survey Organization (NSSO) puts out a decennial All India Debt and Investment Survey (AIDIS) which estimate household balance sheets

¹³Since government accounts are disclosed for audit purposes, they simply cumulate past flows rather than following an accrual system. This works for financial loans but does not give a proper picture of capital assets. I use the IMF's accrual based estimate of public debt for core government (Abbas et al., 2011) as the benchmark debt series

downloaded from the Federal Reserve of St Louis (FRED) database. More detailed information on sources, concepts and data history are made available in the online appendix (section A and B) of this article. The entire dataset can be reconstructed using raw sources digitized in the supplementary database.

2.2 Main concepts

2.2.1 National wealth

According to the UN SNA “national wealth W is the sum, for the economy as a whole, of non-financial assets and net claims on the rest of the world.” It can be defined alternatively as the sum of public (W_g) and private wealth (W_p) where each owns wealth equaling the sum of financial and net-of-liabilities non financial wealth. Social accounting institutions can be further broken by claims into households, non-profit institutions serving households (NPISH), corporations, government and the rest of the world. At the aggregate level, financial wealth nets out to zero since the liabilities of one sector equals the assets of another.

In simpler terms, national wealth is the aggregation of three kinds of assets. Non-produced (eg land), produced non-financial assets (eg machinery, buildings, dwellings etc) and net foreign assets. Economists have long used produced capital stock as the barometer of growth and development, typically being interested in capital-output ratios. Wealth however is a broader concept bringing together the production side of the economy with real constraints such as limited land or mineral reserves. Intangibles are also included in the UN SNA accounting framework. In conjunction with the net of liabilities foreign asset position (NFA), national wealth can be written as:

$$W_t = \underbrace{V_t}_{Land} + \overbrace{K_t}^{\text{Produced assets}} + NFA_t \equiv W_p + W_g \quad (1)$$

All aggregates are measured in current prices. Other non-financial assets such as precious metals (gold & silver) are also part of national wealth, but I exclude them from benchmark calculations due to lack of consistent data. These assets play a much smaller role in the production side of the economy but do impact aggregate demand depending on saving preferences¹⁴ of households.

¹⁴Indian households have historically had a tremendous affinity to holding gold and silver in their portfolio. This preference has withstood the changing economic structures of over a century. Badarinza et al. (2016) estimate a

Using assumptions on data from scattered sources, alternative wealth series have also been computed; readers are referred to the supplementary database and online appendix for details. Inclusion of gold and silver increases the size of aggregate national wealth but on the whole their movements are not large enough to change any long run trends.

2.2.2 Market value vs book value national wealth

Although SNA definitions of national wealth correspond to perpetual inventory type methods (PIM), recently many authors, following Piketty and Zucman (2014), have begun to rely on market value national wealth where corporate net worth is measured using the equity holdings of households. Book value national wealth equals market value national wealth plus the residual net worth of the corporate sector with both definitions converging when Tobin's Q equals 1. In my assessment with corporate balance sheet constraints it is a rather huge challenge to compute market value national wealth with precision. I only use book value national wealth in all my series. Over the long run there is sufficient reason to assume that market and book values would be relatively similar in trend if not size. Although in the appendix I discuss the pros and cons of applying either method to India, I discuss the main elements briefly.

In the 1950s, according to industrial reports, Mukherjee and Sastry (1959) found market value national wealth to be quite well approximated by book value measurement. It is likely that Tobin's Q was lower during the peak years of the Hindu rate of growth because of financial repression. In more recent years, evidence from samples of corporations suggests Tobin's Q is close to 1; roughly 1.1-1.2 in the 1990s (Khanna and Palepu, 2005) and around 0.94 for large Indian corporations in the 2000s (Allen et al., 2006). Its important to note, following the latter reference, that market capitalization and Tobin's Q in India is a very imperfect source of information regarding corporate net worth. Historically, the equities of a large fraction of Indian companies do not experience much (if any) trading. Inventories which appear on book value accounts on the other hand move faster, giving a more updated sense of prices.

significant fraction of household wealth stored in gold around 2011-12. Imports of gold were strongly regulated in the post independence era but for past political elites, especially royals, gold was the main store of value. Administrators were acutely aware of this and foreign conquerors were seduced by the stock of gold stored in India. Atkinson (1902) used production capacity and rough estimates of plunder and loot to estimates the stock of gold in the late nineteenth century. Gold & silver were worth almost one year of national income in this period.

2.2.3 Income and savings

The definition of national income (Y) is standard, i.e net-of-depreciation domestic product plus net factor income (NFIA) from abroad. The flow of savings (S) are defined as net-of-depreciation capital formation plus net foreign investment and capital transfers from abroad. Coverage of saving flows, especially after 1950 is very complete and allows a full institutional decomposition of savings. Each institution's saving is the sum of capital expenditure and net lending. I use capital finance accounts to compute public sector (administrative government, public enterprises) savings. Private savings are derived as the residual of national *less* public saving flows.

2.2.4 Data coverage

Data coverage is as follows: National wealth and its components are available for the entire 1860-2012 period on a roughly decennial basis. Capital stock series (domestic produced assets) are annual starting 1981. National income data is annual for 1900-2012 along with further estimates for 1860, 1875 and 1895 using Goldsmith's adjustments for depreciation. The aggregate saving rate is available for 1900-2012 and its private and public decompositions start in 1951. Since pre-1900 national incomes and inflation estimates are too fragile, I do not use them in any decompositions. Government assets are given for select years in the post-independence era 1950-2012 but public debt estimates are annual for the same reference period.

The integrated database, at the heart of this research, represents a unique and integrated set of long run macroeconomic facts for India. These aggregated time series for the first time combine national balance sheets, continuous long run national income, price indices for output and equities, decompositions of wealth accumulation and the structure of saving and capital formation.

2.3 Wealth-income ratios

The evolution of wealth itself is determined by accounting for new capital accumulation and revaluation of existing assets:

$$W_{t+n} = W_t + S_t + \delta_{t+n} W_t \quad (2)$$

Basically, changes in the level of wealth over time are either volume (savings) driven or due to a price effect (capital gains, $\delta_{t+n} W_t$). From a macro-history perspective, the key long term evolution is

$\beta_t = W_t/Y_t$; the wealth-income ratio. β denotes the years of annual national incomes necessary to reproduce the stock of wealth. Obviously capital, wealth and production change enormously over time so that (more than constant price series) wealth-income ratio scales these metamorphoses in a meaningful way.

If in the long run there are no relative price deviations ($\delta = 0$) - for example if wealth is purely reproducible capital - then the steady state is defined by convergence of wealth and income growth rates $\beta_t \rightarrow \beta = s/g$. The slower the rate of economic growth, the longer it takes for national income to reconstitute the stock of wealth. Fundamentally, this is the one good Harrod-Domar-Solow steady state result but it applies to a more general class of models with balanced growth. Historically asset prices have in fact played an important role, so one-good models are not always justified. Sustained price deviations can result from asymmetric economic shocks, real estate pressures or structural capitalization of monopoly rents. It is better to empirically distinguish the contribution of each to why and how wealth evolves historically.

2.4 Multiplicative versus additive wealth equations

Using the framework in Eqq 2 and macro-accounting, wealth accumulation can be decomposed into its constituent driving forces - savings, asset prices and initial wealth. I capture the main channels (accumulation versus prices) using decomposition equations. In multiplicative models, where wealth evolves according to $W_{t+1} = (1 + q)(W_t + sY_t)$, components of wealth accumulation can be split according to:

$$1 + q = \frac{(1 + g_w)}{(1 + g_{ws})} \quad (3)$$

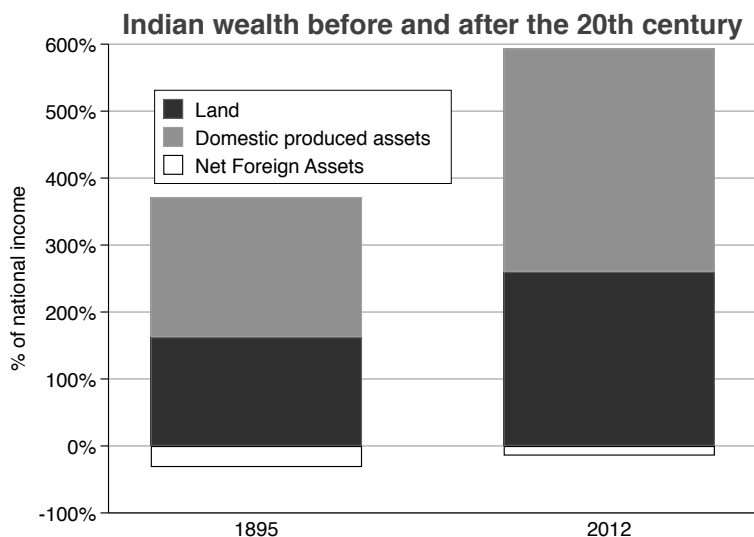
Where $1 + q$ is the (real) capital gains factor, $1 + g_w = (W_{t+1})/(W_t)$ is the wealth growth factor and $1 + g_{ws}$ is the volume driven wealth growth factor with $g_{ws} = s/\beta_t$. With savings rate information, the capital gains factor can be derived as a residual.

The additive equation can be derived directly by cumulating savings and dividing Eqq 2 by Y_{t+1} to get:

$$\beta_{t+n} = \underbrace{\frac{W_t}{Y_{t+n}}}_{\text{Initial wealth}} + \underbrace{\frac{S_{t,t+n}}{Y_{t+n}}}_{\text{Cumulated savings}} + \underbrace{\frac{\delta_{t+n} W_t}{Y_{t+n}}}_{\text{Cumulated capital gains}} \quad (4)$$

With either method, I use the capital gains portion ($1 + q$ or $\frac{\delta_{t+n}W_t}{Y_{t+n}}$) to capture all other determinants barring saving rates or cumulated saving. They are the residual explanations when growth of wealth cannot be explained purely by savings as per the data. Note that in the long run, savings are much more essential to the multiplicative equation because asset prices need to be “multiplied” with some non-zero element. Even with structural capital gains, as $n \rightarrow \infty$, if saving rates are rising over time then they will acquire much more importance as an explanation of $1 + g_w$. The additive decomposition is better in the medium run, particularly because the initial wealth factor¹⁵ can be important over smaller time frames. I provide both decompositions since they convey important information in different ways.

3 Results: Indian wealth in the long run



Benchmark series. National wealth = land + produced assets (domestic) + net foreign assets.

Source: Author’s computations in Supplementary Database Table 3B

Figure 2: Structure of national wealth in India 1895 vs 2012

It is best to start with what is arguably the most simple and straightforward result. According to Figure 2 India became wealthier in the early 21st century. By 2012, national wealth was worth almost 550-600% (or six years) of national income as opposed to around 350-400% at the end of

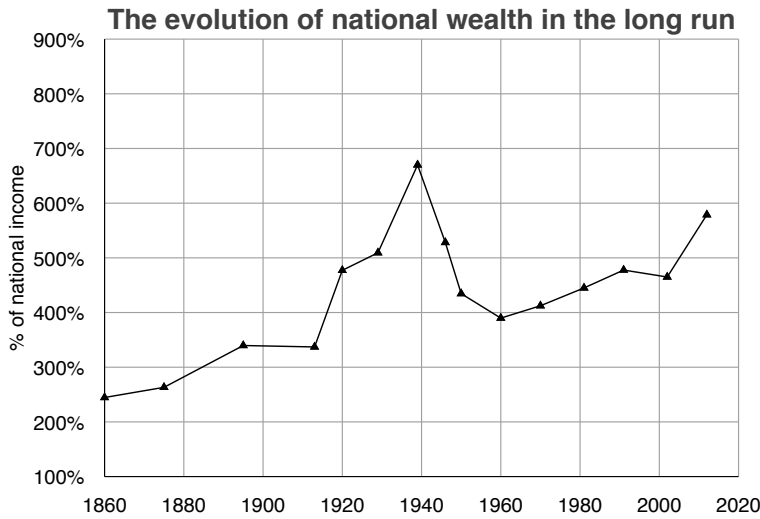
¹⁵Because $\beta_{\text{initial}} = \frac{W_t}{Y_{t+n}} = \beta_t / (1 + g)^n$, the weight of this factor declines over the long run. See Section C of the online appendix for discussion of the details, merits and mechanisms of both equations

the nineteenth century, i.e more than a century ago. The accumulation of produced assets in the 21st century seemed to be almost three years worth of national income, compared to two around 1895. Consider that in 1895, Indian national income was a fraction of the equivalent in Britain, while in 2012 it ranked amongst the top ten economies and the size of wealth accumulation is undoubtedly impressive. This is in fact what should be expected from increasing the production frontier over the development process. Real national income multiplied nearly 1800% between 1900-01 and 2000-01 with the bulk of growth concentrated around the end of the 20th century. Sustained per-capita income growth pushed living standards above subsistence, so that higher savings and capital accumulation were made possible. Table 1 shows an almost quadrupling of saving rates over 1950-80 and then doubling from 1980-2012. Higher wealth-income ratios on either side of the twentieth century are in fact fairly well reflected in averages of s/g profiles for the colonial and post colonial periods.

Sub-period	Real growth of national wealth (gw)	Real growth of national income (g)	Savings out of national income (s)	Steady state formula ($\beta^* = s/g$)
1913-1946	2.60%	1.18%	2.59%	220.05%
1950-1981	3.91%	3.83%	10.56%	275.54%
1981-2012	6.91%	6.04%	22.69%	375.59%

Table 1: Growth and saving rates in India 1913-2012. Supplementary database (Table 6A). Benchmark national wealth series

At the same time, the simple capital accumulation portrait does not explain very well the non-linear evolution of India's wealth-income ratio. Figure 3 shows the 1860-2012 trajectory of this ratio, suggesting a more erratic path than suggested by the s/g Solow process. Between 1920-39, Indian national wealth surged to almost 700% of national income. Even without incorporating any historical background of India's colonial economy, would it be realistic to claim that India was in fact "wealthiest" during the interwar period? The simple answer is obviously no, and the temporary nature of these high values is immediately obvious considering the immediate decline during World War II and Indian independence. Reinstating reality, India did not suffer the same



Benchmark series. National wealth = land + produced assets (domestic) + net foreign assets.

Source: Author's computations in Supplementary Database Table 3B

Figure 3: Wealth-income ratios in India 1860-2012

wartime capital destructions as Europe¹⁶ to experience such a decline. More likely, the interwar surge was itself a temporary amplification due to prices and economic downturns. Remembering the narrow range of assets and previous phase of capital accumulation (1860-1913) even a small decline in nominal output could produce high wealth-income ratios.

Sub-period	New accumula- tion, $g_{sw} = s/\beta$	Real rate of capital gains, $q = \frac{(1+g_w)}{(1+g_{sw})} - 1$	(1) % growth of wealth due to saving	(2) % growth of wealth due to capital gains
1913-1946	0.77%	1.82%	30.12%	69.88%
1950-1981	2.43%	1.44%	63.07%	36.93%
1981-2012	5.10%	1.72%	75.05%	24.95%

Table 2: Sources of wealth accumulation 1913-2012. Multiplicative decompositions using benchmark wealth series. Supplementary database (Table 6A)

¹⁶See (Piketty and Zucman, 2014) for an accounting of these destruction type factors in European wealth during both wars

3.1 Decompositions and the changing structure of wealth

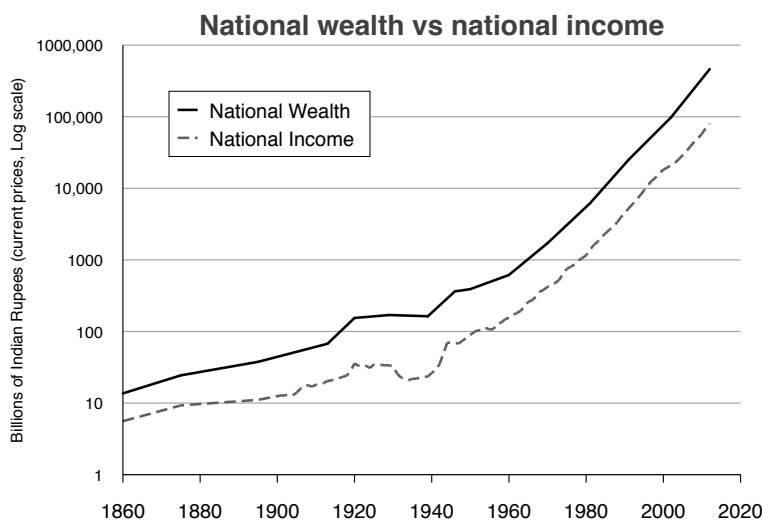
Regardless, the gap between the growth rates of wealth and output was nearly 1.5% more in colonial India's last few decades, thereafter reducing to less than 1% in the subsequent years. To assess the role of accumulated savings versus asset-output price deviations in the long run, I estimated multiplicative wealth equations for India between 1913 and 2012. The results are presented in Table 2. Relative asset prices dominated the colonial wealth-income ratio, i.e they explained almost 70% of the real growth of wealth. This effect corroborates the magnitude and importance of price fluctuations estimated by Roy (1995) for the early-mid twentieth century. After independence, the bulk explanation shifted toward savings driven wealth growth. Interestingly, in the post 1980s period the contribution of savings was even larger than 1950-80. It is worth noting that nationalizations and land reforms (between 1955-74) were hardly a recipe for better capital gains. And in fact, as expected the real rate of capital gains was marginally higher in 1981-2012 than in 1950-80. At the estimated rates (1.72%), relative price appreciations would alone have increased wealth to around 170% of its initial 1981 level. The underlying effect is in fact purely a reflection of consistently higher saving rates¹⁷ for every subsequent period. These increases were impressive enough so that s actually rose more than β to deliver higher $g_{sw} = s/\beta$. Real rates of capital gains in the 1.5% to 1.8% range would have mattered much more with a 10% rate of saving, as opposed to 20-24% between 1981-2012.

3.1.1 Interwar India and the determinants of wealth growth

The interwar period is of particular interest because growth rates were low enough to amplify a small capital gain into higher wealth-income ratios. For example, consider a 300% wealth-income ratio and no further accumulation or economic growth. With a 1.8% real rate of capital gains, the ratio rises to almost 430% in two decades. By its very nature, this size of wealth is a candidate to disappear just as quickly due to (say) 1-2% national income growth or even a collapse in the market for a particular asset that undergoes appreciation. The question is which assets were generating price appreciations during the interwar period. A second (related) question is whether the magnitude was amplified perhaps by a denominator effect. The wealth-income ratio has an

¹⁷Note that saving rates are period wise averages $\frac{\sum s_t Y_t}{\sum Y_t}$ so that saving rates associated with higher levels of national income carry more weight. Since produced assets are measured at book value, they will rise with higher capital accumulation in high saving phases

asset price index in its numerator and an output price index in its denominator, which means a fall in output prices can also generate real capital gains. Separate trajectories for national wealth and income (nominal) in Figure 4 show that this denominator effect was indeed present. With foreign demand collapsing after the Great Depression, nominal output trended strongly downwards. The value of wealth stayed stable between 1920-39 leading to a divergences between asset and output prices. A denominator driven rise in the wealth-income ratio is not unique to India. Evidence from other countries suggests a similar trend during the Great Depression (Figure 5)

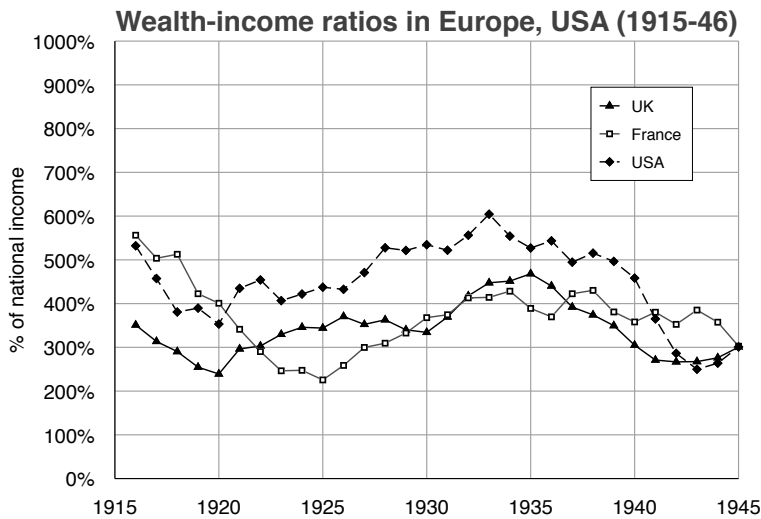


Source: Author's computations in Supplementary Database Table 3B

Figure 4: National wealth and income at scale.

In terms of actual price appreciations, produced assets such as the capital stock of corporations are not ideal candidates for appreciating assets in the national portfolio. Since they are measured at book value they correspond closely¹⁸ to output prices. In fact, as Figure 6 shows, the aggregate value of land was playing a salient role in the evolution of the 1920-39 wealth-income ratio. Foreign assets (negative throughout) were much lower, measured in terms of national income. An accumulation of produced assets did occur, especially between 1929-39. But its magnitude appears to have been dwarfed by the prominence of land. What is most crucial is that after 1939 the ratio of land to national income rapidly declined. This occurred well before the loss of any

¹⁸Of course there are still remnant price effects due to the changing composition of reproducible assets, for example using more new machinery with different lifespans.



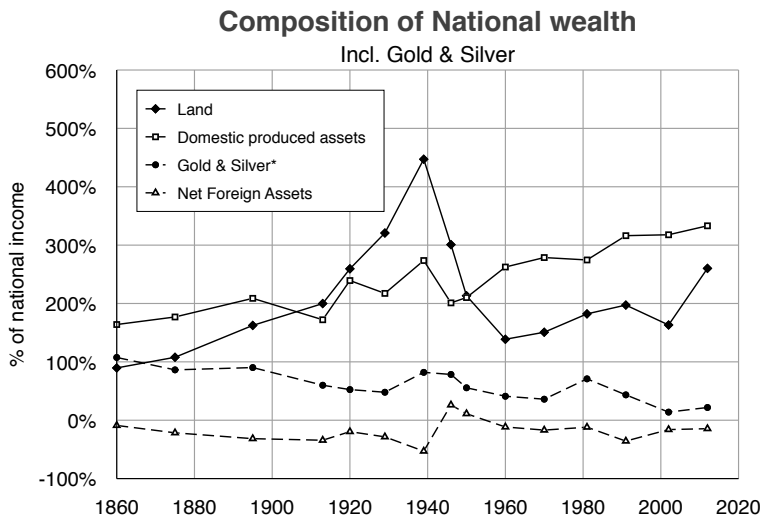
Source: World Inequality Database (wid.world)

Figure 5: Wealth-income ratios in USA, UK and France 1915-46

land area (and national income) to Pakistan after the partition of 1947. Since land cannot otherwise be destroyed, these overall dynamics had to be combinations of land prices and pre-1947 denominator effects.

The rising price of land in class based societies was a well known feature of Ricardian rent theory. In an economy with ongoing capital accumulation, Ricardo hypothesized that once the best land was exhausted, production would have to move to less fertile land requiring more investment to sustain high yields. In a land market with binding supply constraints, land prices would have to rise to stem the high demand from capital accumulation and population growth. The prediction was an enrichment of the landowning gentry¹⁹ who had inherited rights to this non-reproducible (or natural) asset. This theory was not far off the mark in interwar India. Economic historians of all vintages collectivize around colonial India's land dependence. Land literally became scarce in rural India, where over 70% of the country's population resided. Economic growth over 1870-1914 had mostly exploited low hanging fruit. Agricultural yields stayed static and expansion derived entirely from increased acreage. The slowdown in acreage, starting in the second decade of the twentieth century, was at the root of the economic crises that plagued the economy through the

¹⁹To be sure, there need not be a realized land constraint. In a growth model with given wage rates, even the anticipation of future rents (when the limit become effective), get capitalized into higher prices in the present. See the land constrained model in Foley and Michl (1999).



*Gold & silver Scenario 1.

Source: Author's computations in Supplementary Database Table 3B

Figure 6: Composition of national wealth 1860-2012

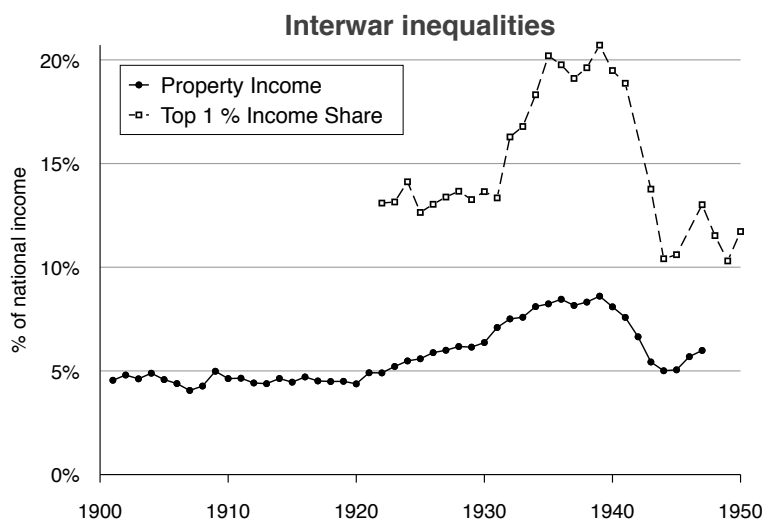
entire interwar period (Roy, 2006). To be sure, the pressure from the demand side did not ease in conjunction with the supply side limit. Land per person continued to fall secularly because India underwent a huge demographic shift²⁰ starting 1921. No further area was brought under cultivation and the urban component was too small a fraction (Goldsmith, 1983) to matter. In an already narrow asset range, the portfolio value of land ownership therefore went up.

Considering the flat nominal value²¹ of wealth between 1920-39 and the output descent, what matters is land prices rose in some regions even if they fell in others during the depression years. Micro studies conducted by different authors identified significant price appreciations in land markets which speak to this claim. Hirashima (2008) analyzed land trading in integrated Punjab until 1940, i.e the territory which now falls in India and Pakistan. Note that between 1870-1939 Punjab had received a third of irrigation investment and formed half the total irrigated area. It was one of

²⁰Due to the rise of commerce in the late nineteenth century, agricultural output became more heavily cash crop oriented. The little productivity growth in yields was entirely in commercial crops. Food crops stayed stagnant in terms of output per acre. The 1918-21 period was a demographic shift in 20th century India. Birth rates stayed stable but death rates declined. From 0.5-0.6% in previous decades, India's population grew consistently over 1.1% after 1921. See Guha (1991)

²¹In nominal terms, the value of land stayed almost the same for 1929 and 1939

the more prioritized regions in the agrarian expansion program. Transactions data revealed that while rents grew in spurts, land prices rose almost continuously. The creation of a land market around 1890 itself drew different players into trading of this asset. Using investment and rental data, Hirashima estimated speculative capital gains to be the main explanation for price appreciations. A separate study of land records in the same time and region by Mukerji (1969) put land price appreciation at nearly 1000%.



Source: Author's computations and World Inequality Database (wid.world). See Supplementary Database Table 2B

Figure 7: Income inequality and property income shares in interwar India

In hindsight, social and class inequalities during the interwar period underline the environment under high wealth-income ratios. Those who owned property or capital prospered while wage dependent rural masses were hit by the economic slowdown. The Nizam (ruler) of Hyderabad was ranked on top of the global wealth rankings by Time Magazine²² in 1937, whilst poverty was peaking in India. The entire princely class (around 600 local rulers) found its net worth swelling at a time where agriculture was unprofitable while domestic industry needed capital. Accordingly, their wealth became more “in-demand” for industrial finance under the capital downturn in global markets induced by the depression (Mukherjee, 2008). Top income shares surged and income

²²See the cover of time magazine for February 22, 1937. The Nizam was the largest private landowner in India with roughly 40% of his wealth comprising land and mining rights.

from property holdings peaked between 1920-39 (Figure 7). Alvaredo et al. (2017) estimate that the rich were mostly Indians, rather than British officials based in India. These included professionals who worked outside agriculture but also the landowning classes and indigenous capitalists (Maddison, 1971). In terms of retaining surpluses, the 1930s were beneficial both pre and post taxes for the landed gentry. Their obligations to the state had been set in nominal terms around the 1880s. By the 1930s they only paid a fraction of their surplus as land revenues, retaining most of it.

3.2 Resurgent asset prices and international comparison

I refrain from calling the interwar period a “bubble” because the rise and fall of wealth-income ratios lasted a full four decades (1920-60). And realistically, they were mostly a marriage including economic growth, demographics and structural factors such as aggregate land shortages; as opposed to pure speculative price appreciations. Just as India did not get wealthy during the Great Depression, it did not become poor or capital-efficient with falling wealth-income ratios between 1939-60.

The aggregate value of wealth did however come down from 670% to almost 390% by 1960, and it was once again mostly land driven. A central factor initiating this process was the return of nominal output prices²³ and real economic growth during the wartime buildup. Pressing demand switched towards industrial capital and British borrowing was strong enough to temporarily reverse the net-debtor position of India. Certainly events that directly impacted the volume of land were important; such as the independence or partition of India and annexation of land from the two main agrarian regions (Punjab, Bengal) into Pakistan. But the decline continued well into the 1950s²⁴ i.e after the political turbulences of the 1939-47 period. The sole constant for the full two

²³Consumer price inflation and declining wage ratios between agriculture and industrial labor have been cited as the main explanation of rural distress in this period. The Bengal Famine of 1943, a combination of high rice prices, labor destitution and forced saving is one such case study. See Sen (1981)

²⁴Again there were sufficient reasons to believe that land was less valuable in itself. In the 1950s, India initiated land reforms to mitigate the socio-economic inequalities of rural society inherited from the British empire. This land reform was redistributive rather than expansive. Large owners who enriched themselves during the depression stood to lose sizable estates and would have found few buyers given that official ceilings restricted the accumulation of sizable holdings.

decades up to 1960 was that nominal and real economic growth were higher than pre-1939 rates. It implies a very simple mechanism. Just as wealth-income ratios rose because of low growth, they declined because of higher growth.

Perhaps the main distinguishing feature of the post 1960s period is lower output fluctuations. This explains a gradual, non-erratic trend in wealth-income ratios. Economic growth accelerated after 1980 as India moved out of Hindu rates of growth (Rodrik and Subramanian, 2005). But there were no decade long stagnations at any point between 1960-2012. Even the Hindu growth period of 1950-80 had significant per-capita income growth rates (1.1%-1.5%). Capital accumulation however was changing with the rate of saving rising and the state directly embarking on a capital-led industrialization strategy²⁵ as early as the 1950s. It is tempting to attribute the rising wealth-income ratio to a Solow-Marx type *deterministic* capital accumulation process. As further decompositions based on additive wealth equations (Table 3) show, the underlying forces are slightly more complex.

The key long run statistic here is that between 1913-2012, cumulated capital gains explain a very large proportion of aggregate wealth. That is, starting with wealth in 1913 as a proportion of 2012 national income ($\frac{W_{1913}}{Y_{2012}}$), half the subsequent additions were cumulated savings. The remaining changes, nearly half (45%) save for initial wealth, were accounted for by asset prices. Looking into shorter sub-periods as series, it is clear that the nature of wealth accumulation transformed significantly. In the interwar period, initial wealth mattered a lot (because national income was barely growing). Remembering that post 1960 trends in wealth-income ratios are gradual, initial wealth remained important but its share was increasingly appropriated by savings. Perhaps most strikingly, this type of decomposition reveals the close determination of the shape of wealth-income ratios due to asset price fluctuations alone.

In additive wealth equations, the presence of initial wealth distinguishes the magnitude of capital gains. To understand the revival of asset prices, one has to contextualize the initial wealth on

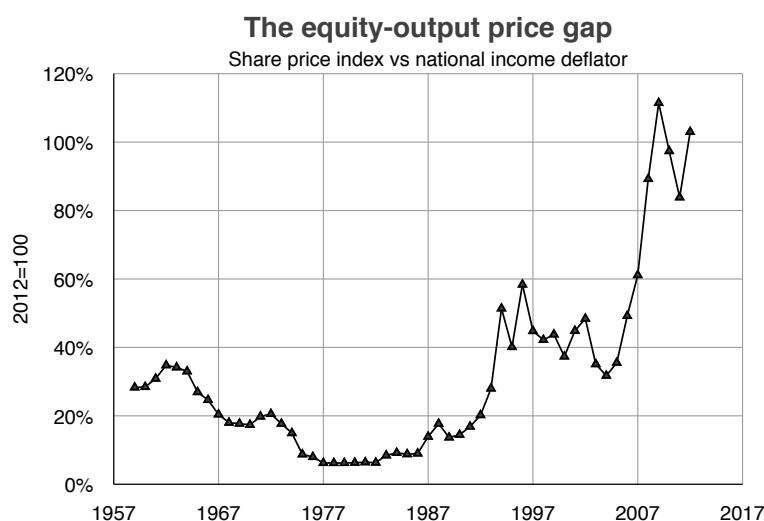
²⁵The second five year plan (1956-61) - modeled along Soviet lines was developed by the statistician PC Mahalanobis. It was inspired by the Harrod-Feldman model of growth with explicit focus on developing the capital goods sector. The model itself has a theoretical side, expressed in Mahalanobis (1953). It was soon sacrificed when inflation concerns arose but the state controlled model of accumulation was enmeshed in policy thinking well into the 1970s. Historians and political scientists often claim this to be a residual of mistrust in private capital, an idea probably inherited from the laissez-faire thinking around capital in British India. See Kohli (2006)

Period	$\beta_t = W_t/Y_t$	$\beta_{t+n} = W_{t+n}/Y_{t+n}$	Initial Wealth Effect W_t/Y_{t+n}	Cumulated Savings Effect $S_{t,t+n}/Y_{t+n}$	Cumulated Capital Gains effect $\delta_{t+n}W_t/Y_{t+n}$	(1) % W_{t+n} due to initial wealth	(2) % W_{t+n} due to cumulated savings	(3) % W_{t+n} due to asset prices
1913-1920	337%	477%	323.08%	26.25%	82.36%	67.71%	5.50%	26.79%
1920-1929	477%	509%	381.81%	23.50%	98.53%	74.96%	4.61%	20.42%
1929-1939	509%	670%	507.92%	40.91%	148.58%	75.81%	6.11%	18.08%
1939-1946	670%	528%	543.10%	16.75%	-31.00%	102.84%	3.17%	-6.01%
1950-1960	435%	390%	285.30%	51.75%	58.93%	73.19%	13.27%	13.54%
1960-1970	390%	412%	269.78%	75.00%	63.49%	65.42%	18.19%	16.40%
1970-1981	412%	445%	285.40%	114.32%	46.09%	64.14%	25.69%	10.17%
1981-1991	445%	478%	267.00%	100.47%	109.67%	55.89%	21.03%	23.08%
1991-2002	478%	465%	266.92%	141.07%	57.56%	57.40%	30.34%	12.26%
2002-2012	465%	579%	225.56%	194.47%	154.35%	38.97%	33.60%	27.43%
1913-2012	337%	579%	11.97%	309.21%	253.20%	2.07%	53.43%	44.51%

Table 3: Sources of wealth accumulation 1913-2012. Additive decompositions using benchmark wealth series. Supplementary database (Table 6A)

which these price gains were being made. In recent periods, gains were large *despite* smaller initial wealth. Take for example 1920-29 as a representative sub-period. As a proportion of 1929 national income, initial wealth was worth 380% and it produced a gain worth 100%. Now consider 2002-2012 in terms of 2012 national income. Initial wealth was only around 225% but it produced a gain worth 154%. Clearly gains were larger in magnitude for the latter period. The fall and rise of wealth between 1939-2012 is strongly reflected in the U shaped size of capital gains. There were clear capital losses during price corrections in the 1939-46 period. But gradually, cumulated capital gains returned to around 100-150% of national income (or 22-28% of the wealth-income ratio) around 1981-2012.

3.2.1 Book versus market value wealth



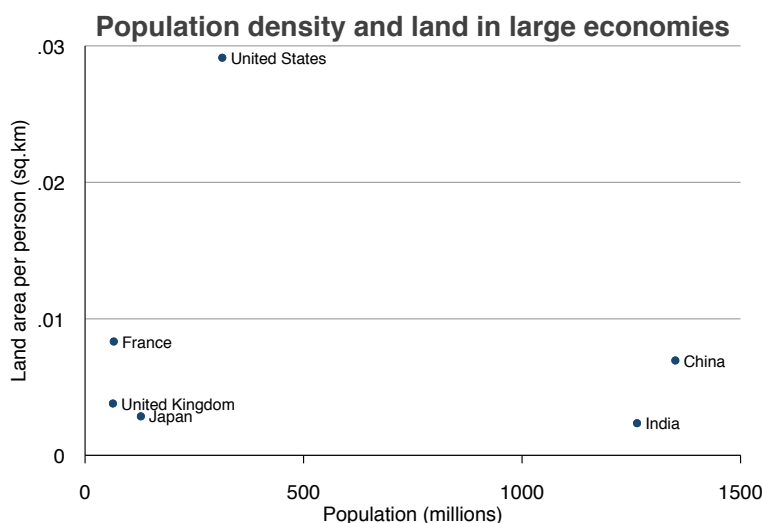
Source: Author's computations in Supplementary Database Table 2B

Figure 8: Ratio of stock market prices and national income deflator (2012=100)

So far any discussion of capital gains is essentially a discussion of land prices. Would the wealth-income ratio (and its determinants) be any different if market-value national wealth was deployed? By the latter measure, the book value of corporate assets would be replaced by market value assets and asset price dynamics would include fluctuations in Tobin's q . A limited (but meaningful) understanding can be gleaned on the basis of equity price indices. Figure 8 tracks the evolution of listed equity prices relative to consumer price inflation with the ratio set at 100% for 2012. These trends reveal most certainly that equities appreciated faster than consumer inflation. Most economists and financial experts would agree to this fact. The interesting trend in this series is a J shape between 1957-2012, i.e post independence inflation expropriated equity prices through to the late 1980s. That these developments ran parallel to nationalizations and high corporate taxes in the 1960s and 1970s is hardly surprising. On the whole however, these ratios remain in agreement²⁶ with benchmark wealth-income ratios for India over this period. If anything, a market value measure would have magnified the contributions of asset prices slightly for 1981-2012.

²⁶The corporate sector was less than 18% of produced domestic assets around 1980 and rose to around 29% by 2012. Thus its impact on aggregate wealth would have been significant mostly after 2000

As far as wealth holdings in recent decades are concerned, volume and prices of land are still the most important determinants. In colonial India, land ownership and scarcity dominated. But even in 2012, households continue to hold over 60% (90%) of their wealth as land (real estate) according to NSSO surveys. Preferences for holding land were inelastic across generations and the wealth distribution (Anand and Thampi, 2016). Note that financial deepening and access in India are still fairly limited, meaning safety and low risk returns can be easily channeled into such traditional forms of wealth ownership. Land acquisition remains the most contentious political issue and center of peasant conflict despite industrial growth or agricultural distress (Levien, 2012). Even looking at the extreme upper tail of the wealth distribution, Gandhi and Walton (2012) found capitalists in real estate and construction sectors to be the major movers on billionaire rankings (and net worth) since the 1990s.



Source: World Bank Open Database

Figure 9: Land-population ratios in large economies (2012)

Figure 9 shows cross country land per person for the largest economies in 2012. Clearly, land in India is most scarce relative to population. A relative “land abundance effect” may also explain the comparative importance of land in national wealth. For example, a labor surplus (or abundance) is often used to explain lower wages in developing countries as opposed to (say) Western Europe. Based on the same logic, Piketty and Zucman (2014) attributed high land prices in nineteenth century Europe to lower land volume. In USA, around the same period, land was

relatively abundant and so worth less in comparative terms. Countries with lower land *volume* per worker should have higher²⁷ land *values* relative to national income. A similar mechanism could, in principle, reinforce India's persistently high land to national income ratios.

3.2.2 Comparative long run evolutions: India vs rich countries

I turn next towards the evolution of Indian wealth relative to rich countries. Starting in the 1960s, wealth-income ratios in India, USA, UK and France became quite similar in size²⁸ and trend. In the late 20th century, these ratios were in the 400-500% range and closer to 500-600% in the 21st century. The underlying processes were however deeply different. Europe and USA had sustained very large wealth-income ratios well before the beginning of the twentieth century. The latter half of the twentieth century represented a recovery of capital and asset prices to their peaks. The Indian peaks were a short lived divergence, also visible in rich countries. Effectively, India was only building its wealth and capital after independence. In the second half of the nineteenth century, disparities were much more apparent. Indian wealth was only worth around two to three years of national income. British and French wealth stood at over seven years²⁹ of their respective national incomes.

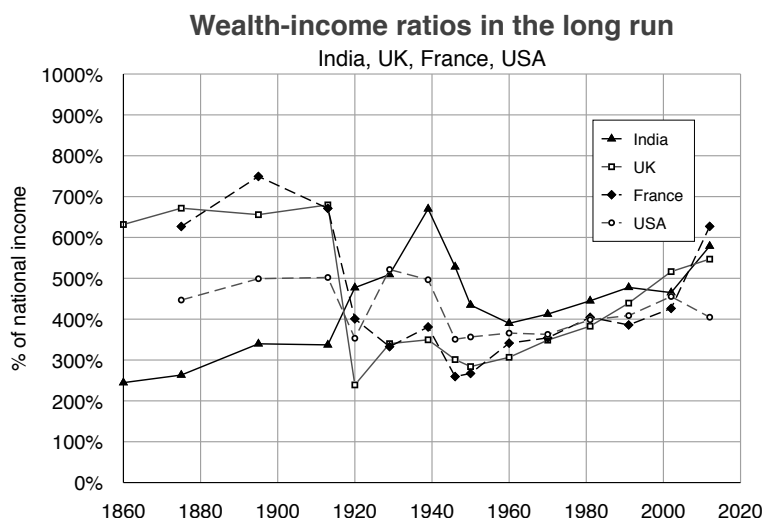
Why were wealth-income ratios so low in India in the nineteenth century? One candidate explanation may be that the prevailing rentier type society³⁰ had little incentive to improve the viability of agriculture (Maddison, 1971). For example, European land received past investment (irrigation, drainage) which made it much more productive in the eighteenth and nineteenth century. Indian landlords were on the other hand content to retain their share of the surplus once land revenues had been paid out. Relatedly, under the low growth and productivity economic environment, savings may have been too low in the first half of the nineteenth century to allow capital accumulation.

²⁷ Assuming the elasticity of substitution between land and labor is less than 1

²⁸ Only the American ratio falls in 2012 due to very high public debt

²⁹ The lower US wealth-income ratio is mostly due to faster growth relative to Europe and therefore a lower s/g steady state

³⁰ A good indication is that surpluses had been sunk into a huge stock of unproductive assets like gold and silver. Their size was worth almost 100% of national income (Figure 6). Note that a rentier system was reinforced by the corporate nature of the East India Company, which had no overwhelming burden to radically modernize the existing social structure. In fact, the Company was well aware of the Ricardian theory of rent, which it used to identify differential profitabilities of land in order to develop property systems. See McAlpin (1984)



Source: Author's computations and World Inequality Database (wid.world). See Supplementary Database Table 5A

Figure 10: Wealth-income ratios in France, India, UK and USA

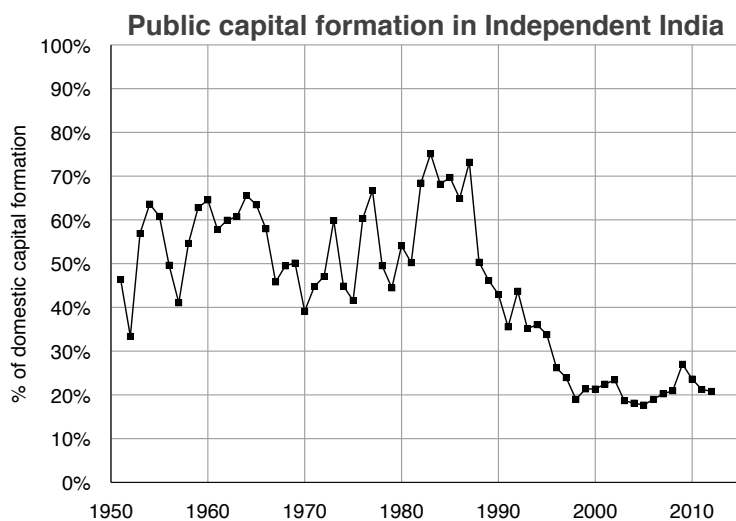
From the outset, it is important to state that data for this period are too fragile and information on savings non-existent. But based on reliable and independent accounts³¹ the suggestion is that economic dynamism only re-appeared once the British Crown came to power in 1858. Poor economies with low saving had a tendency to settle into smaller wealth-income ratios than for example in France or Britain. A classic example is the Swedish case in the mid-nineteenth century (Waldenström, 2017). Wealth-income ratios in Sweden were similar to the US, with the former saving low saving rates and the latter having higher growth rates but both being close on the equilibrium s/g profile.

3.2.3 Political economy of Indian public wealth

Finally, I turn to the changing ownership of national wealth. Was the evolution of Indian wealth the same as the trajectories of private or public wealth? Unfortunately, there are no balance sheets at either level to clearly establish a stylized fact. But the limited data on hand suggest that barring a brief departure in the 1950-80 “planned” phase, the national wealth-national income ratio was closely tracking the private wealth-national income ratio.

³¹See Tomlinson (2013), Broadberry et al. (2015)

Under British rule, the government operated primarily as an administrator, rather than providing basic industrial capital through state enterprises. The British empire kept tax rates low, using revenues to mostly maintain its army and technocrats. There was little by way capital expansion through state enterprises, research or educational institutions. The empire instead allowed indigenous entrepreneurs to function under an unfettered integration with global commerce (Mukherjee, 1976). National wealth, was mostly private wealth and the wealth-income ratio until 1950 could just as easily be termed the private wealth-national income ratio (Goldsmith, 1983).

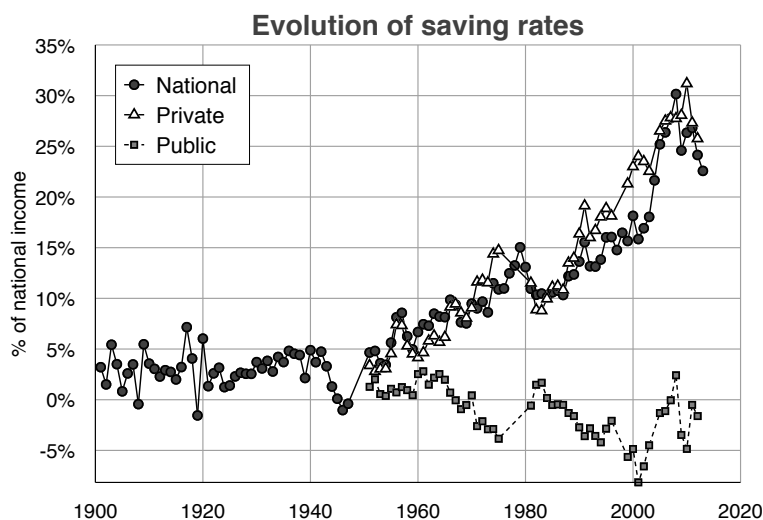


Source: Author's computations in Supplementary Database 2A

Figure 11: Public vs private capital capital formation 1951-2012

Obviously the public sector had to radically transform itself in the early years of independence. From the low initial level around 1950, there is little doubt that the activist state did much to increase capital accumulation and public capital. Question marks only pertain to its efficacy. In this period, there were indicative steps that usurped private wealth into public accounts as for example due to nationalizations between 1955-74. But more concretely, the government founded various public enterprises which then were given monopolies in all the crucial sectors of the economy. Public investment dominated private investment until the mid 1980s (Figure 11). These assets were combined with explicit steps to restrict the personal assets of the rich through highly progressive direct taxations (estate, gifts, wealth and incomes) between 1953-85 (Acharya, 2005).

Overall, relative to colonialism, the share of public wealth had to have been higher in the first decades of independence. Remember that the ratio of land values (mostly private) to national income was falling until at least 1960. Given that eventually the public sector both moved out and was outgrown by the private sector since the 1980s implies that in all likelihood, this pattern was reversed leading into 2012. On the 1860-2012 timeline, if there was ever a peak in the public wealth-national income ratio it had to have been in the planned economic phase of 1950-80.

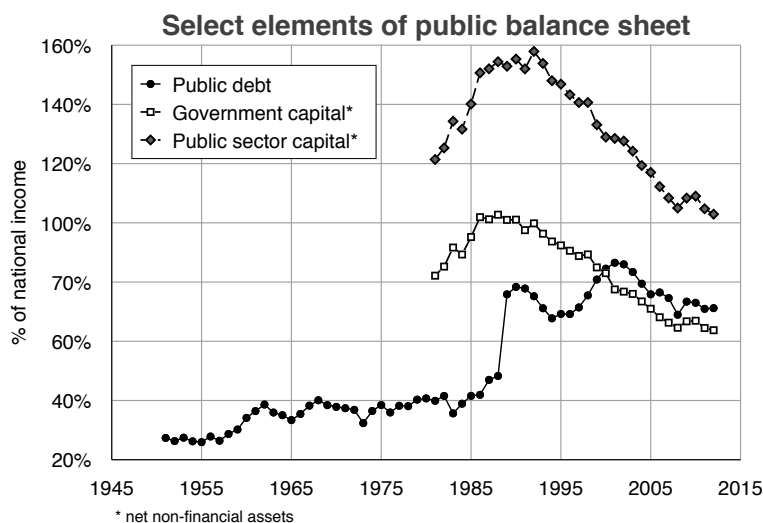


Source: Author's computations in Supplementary Database 2A

Figure 12: The evolution of saving rates 1900-2012

Ideally, one would prefer to evaluate this hypothesis using direct data, i.e for the public sector utilize the sum of its financial assets (net of liabilities) and non-financial assets. The secondary approach (used here) is probabilistic. Conditional on the initial size of the public sector around 1980, evidence from saving and debt favor the possibility that national wealth increasingly became private wealth. National wealth is the sum of public and private wealth. At an aggregate steady state, both should have wealth-national income ratios close to their individual state state formulas s_i/g , where s_i is the rate of saving of each sector. The sector with higher saving rates would have a higher share of national wealth. From the decomposition of the national saving rate in Figure 12 that throughout 1950-2012 the rising national saving rate was being driven by the private saving rate. The public saving rate, lower throughout, turned almost persistently negative starting in the 1990s. The second (and complementary to saving) indicator for lower public wealth is

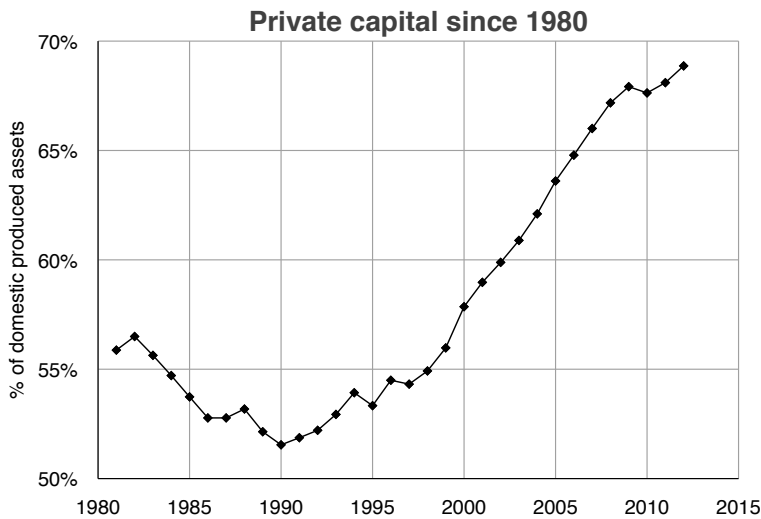
the size of public debt and trends in the size of public capital (Figure 14). Relative to national income, the increase of public debt since 1985 supports the likelihood that the government's net financial assets became smaller. At the same time, the value of public assets were expropriated by economic growth. In 1985, the public sector's non-financial assets were worth almost 150-160% national income and fell to nearly 100% by 2012. Note that accompanying these trends was a rising share of produced assets in national wealth, consistent with the fact that on aggregate these assets became increasingly private (Figure 14).



Public debt corresponds to general government. Public capital includes general government and public enterprises. Source: Author's computations in Supplementary Database 4B

Figure 13: Public capital (non-financial) and public debt 1951-2012.

In sum, the aggregate picture vis-a-vis public and private wealth is the following: (1) the public sector's financial liabilities shifted up considerably after 1990 (2) rising national saving rates represented secularly rising private saving rates and falling public saving rates since 1960 (3) an increasing share of non-financial assets at the national level since 1990 were accounted for by the private sector. It would therefore be extremely unlikely to conclude that public wealth as a proportion of national income rose as fast as private wealth after 1990. Further, this feature strongly agrees with the general decline of public capital in developed and emerging economies since the mid 1980s (Chancel et al., 2018).



Source: Author's computations in Supplementary Database 3C

Figure 14: Public vs private capital share (non-financial) 1981-2012

4 Conclusion

My conclusions are brief. The size and evolution of Indian wealth has been closely dependent on structural shifts and fluctuations in economic growth. Karl Marx had famously argued in Volume I of Capital:

Intrinsically, it is not a question of the higher or lower degree of development of the social antagonisms that result from the natural laws of capitalist production. It is a question of these laws themselves, of these tendencies working with iron necessity towards inevitable results. The country that is more developed industrially only shows, to the less developed, the image of its own future

The basic idea was that accumulation would lead to ever more hoards of capital - the ultimate wealth and ambition of the central antagonists (capitalists) of Marx's thesis. These "stages" would distinguish rich and poor economies. Yet, economic theory has long debated the importance of price versus quantity adjustments and the same concepts apply to the value of wealth in all sorts of economies. From the path of development followed by India, it is obvious that price effects (such as those of Ricardo) and quantities of capital as emphasized by Marx and Solow are both important in determining the importance of aggregate wealth. Because both forces can recur at different stages of development, and certainly due to political/institutional imbalances, the value

of wealth need not follow a deterministic linear path.

This article has presented a first attempt to trace the balance sheets of India in the long run. It does so using limited data and presents evidence for a non-linear evolution of wealth-income ratios in India. While they are important on their own, these fluctuations may also be crucial benchmarks to understand Indian wealth inequality in the long run. At the moment, these series and their decompositions are all that are permitted by existing data.

Acknowledgements

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Online appendix to:
The evolution of wealth-income ratios in India
1860-2012

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Appendices

This appendix presents detailed information on data sources, methods and estimates utilized in the main article. The full database with calculations and raw tables is available in spreadsheet format under the filename **SupplementaryDataIndianWealth.xlsx**. All figures and tables were constructed using this file.

The supplementary dataset is divided into “Final” and “Raw” subheads. Final tables were computed with the linked raw tables with references and online links to the raw dataset (where available). Tables 1-5 contain macro-series based on national accounts, surveys and historical balance sheets. Any figures which list a source separate from the supplementary database were created inside Stata using ssc packages (for eg, World Bank Open Data -wbopendata-).

The rest of this appendix is organized as follows: I start by describing the main concepts such as national wealth, its subcomponents, flows of income and savings. The next section lists detailed datasources, problems and idiosyncrasies of Indian balance sheets with a step-by-step construction of the main tables in the supplementary database. Finally I discuss the different decomposition equations used to see the main drivers of wealth accumulation.

A Definitions

In general the measurement of capital and wealth pose many conceptual difficulties, most of which are extremely well addressed in the appendix of Piketty and Zucman (2014). Here, I combine the nuances of India specific data with conventional methods to compute long run wealth estimates.

The standard guidelines and definitions of national wealth are provided in the United Nations System of National Accounts (SNA). Ownership rights over domestic assets are exerted

by the four main institutional sectors, i.e Households, Non Profit Institutions Serving Households (NPISH), Corporations and Government. The wealth of any institution is the sum of its net assets viz non-financial assets plus net-of-liabilities financial assets. Since at the aggregate level one sector's liabilities constitute another sector's asset, all financial claims cancel out leaving national wealth exactly as the sum of domestic non-financial assets plus the market value of net claims on the rest of the world.

This definition gives a relative advantage in computing wealth estimates at the national level over the long run. Were we interested in (say) only private wealth, then one would require each institution's balance sheet with careful tracking of financial accounts. Needless to say this would be a very difficult task, particularly given constraints in a large developing economy with limited statistical data collection capacity. By considering national wealth, these problems are relegated and instead one can collect estimates of foreign wealth and domestic non-financial assets. On the latter, estimates exist because statistical agencies regularly update capital stock for the purposes of domestic capital-output ratios. Within non-financial assets, wealth is distinguished between reproducible (eg machinery) and non-reproducible (eg land) assets. This distinction is important because if the direction of economic growth draws on more limited assets, then one is likely to see turbulences in relative asset prices with no real growth in the volume of assets. In summary, national wealth (W) identities can be written as follows:

$$\begin{aligned}
 W &= \underbrace{V}_{\text{Land}} + \underbrace{K}_{\text{Produced assets}} + \underbrace{NFA}_{\text{Net foreign assets}} \\
 &= \text{Non-financial assets of Households \& NPISH} \\
 &+ \text{Non-financial assets of Corporations and Government} \\
 &\quad + \text{Net foreign asset position} \\
 &= \text{Private wealth} + \text{Public wealth}
 \end{aligned}$$

The last line in the identity above is perhaps the most basic way of thinking about a country's property interest i.e national wealth is the sum of private and public wealth. By this definition, private (public) wealth is the residual of national wealth less public (private wealth). I use the broadest definition throughout this article (consistent with SNA), i.e regardless of time and source I make an effort to strictly estimate wealth by summing land, capital and (net) foreign assets. The balance between public and private wealth can be inferred by monitoring the balance sheet of the

public sector. In later sections, I provide definitions of the public sector in the SNA/Indian context.

A.1 Components of domestic non-financial assets

Domestic non-financial assets are the sum of produced and non-produced assets over which ownership rights are enforced by respective institutional and which deliver economic benefits to their owners. Produced assets (or reproducible capital) can itself be classified into tangibles (eg machinery) and intangibles (eg software). Non-produced assets (tangibles only) include land underlying buildings and structures, under cultivation, recreational etc as well as subsoil assets such as mineral deposits and oil reserves. Due to data limitations it is only possible to account for land underlying buildings and structures as well as under cultivation in the Indian case.

A.1.1 Reproducible capital stock

Capital is fundamental to the productive structure of any economy. In standard models of balanced economic growth, wealth is usually entirely referred to as reproducible capital and forms the basis of steady state capital-output ratios. Reproducible capital is accumulated through flows of fixed capital formation as well as additions to inventory and exhausted through consumption of fixed capital (depreciation). The typical method of producing these estimates take into account asset life-tables, consumption rates of fixed capital (depreciation) and cumulating new investments - the method broadly known as Perpetual Inventory Method (PIM). Therefore capital stock is measured at book-value, consistent with SNA guidelines, with its current market value determined on the basis of lifespans, differentiated price series (for different assets) and their utilization in the production process. Fixed assets - used in production for longer than the accounting period (one year usually) - count tangibles (dwellings, buildings & structures, machinery, equipment and cultivated assets) and intangibles (software, mineral exploration, art etc). Note that although consumer durables are technically used for more than the accounting period, they are excluded from capital stock as per the SNA. Historical monuments classified as residential are accounted in dwellings while those that are explicitly identified as non-residential count under buildings & structures.

From an institutional perspective in the the Indian national accounting setup (as in the SNA), capital stock is held by the public sector and private¹ sector. The public sector comprises admin-

¹Further divided into joint stock companies and cooperatives

istrative departments, departmental enterprises (fully government controlled enterprises) and non departmental enterprises (public sector production units). The latter functions similar to the corporate sector though equity control is predominantly public. In accounting classifications of other countries, the treatment of the public corporate sector is mixed depending on the degree to which the private corporate sector is defined. However in Indian capital stock data, there is separation of joint-stock companies in the private sector from non-departmental enterprises so that I do not deviate from including capital ownership of public enterprises as part of the public capital stock. The basic definition of produced capital (or assets) is:

$$\begin{aligned} \text{Produced assets, } K &= K_{\text{public}} + K_{\text{private}} \\ &= \underbrace{K_{\text{administrative}} + K_{\text{publicenterprises}}}_{\text{public}} + \underbrace{K_{\text{privatecorporations}} + K_{\text{cooperatives}} + K_{\text{households}}}_{\text{private}} \end{aligned}$$

Corporate capital: The UN SNA guidelines define corporate capital at book-value (measured through PIM), same as households and government. However in recent literature² on wealth-income ratios the alternative market-value definition is utilized to measure corporate wealth as the equity holdings of households. To be sure, book values also measure capital with prices upgraded according to various asset specific indices i.e capital values do not reflect only the value of assets at the time of incorporation. The market value and book value measures of national wealth converge when Tobin's Q equals 1. If it exceeds one then there is residual corporate capital equal to the difference between market and book value national wealth. The market value measure would be preferable for example if one was interested in comparing tax-return based wealth and income accounts with aggregate wealth since for tax-purposes it is the equity values of household wealth that matter. It also holds the advantage that fully reflective aggregate equity values will account for the capital of firms that go out of business - a tendency which may not be as robust in PIM based book values. On the other hand this measure, particularly if used for India, presents serious data challenges. Capital markets have developed slowly and Indian households have in general a very low appetite for equities in their portfolio (Badarinza et al., 2016). The total number of "demat" (stock trading) accounts in India are only around 30-32 million. Therefore including household equities to measure corporate capital would at best produced a limited picture of corporate wealth. It would require both stock market capitalization and sufficiently reliable information to value unlisted companies at appropriate prices. Finally, to keep consistency between historical

²See Online Appendix for Piketty and Zucman (2014)

measures of capital stock and official estimates in more recent years it is preferable to use one method of valuation - in this case the book value method. I discuss further aspects in the data section of corporate capital. For the database associated with this article however I stick to the SNA definition (book value) of national wealth.

A.2 Flows of income and saving

Definitions of national income are followed exactly as outlined in the SNA (1993, 2008) i.e national income equals net-of-depreciation domestic output plus net factor income from abroad. Savings are computed net of depreciation. National savings are the sum of capital formation plus foreign savings (net); at the domestic level inter-institutional lending cancels out, as do net capital transfers. Foreign saving is the sum of the trade balance (exports less imports), net factor income from abroad and capital transfers (net) from the rest of the world. For domestic institutional sectors, net-of-depreciation saving equals net capital expenditure (investment) plus net financial lending. Since national savings are the sum of private and public saving, either institution's saving can be backed out of national saving if the investment and lending profile of one of the two sectors is known.

B Data

This section lists various sources used in the construction of the supplementary database. Table 1A of the database contains the 1860-2012 national income and saving derivation. Table 1B contains savings at the national level allocated also to each institution. Table 2A lists savings, lending and property income as a share of national income. Table 2B contains other long run indicators such as top income shares and mortality rates. Tables 3A-C contain wealth computations along with wealth-income ratios at the national level with breakdowns into their components. Table 4A and B lists selected components of the general government's balance sheet (mostly non-financial assets, investments and debt).

B.1 Sources

Balance sheets on India's aggregate wealth are sparse. Although national accounts have been estimating the flow side of India's economy since 1950, official estimates of capital stock only

began around 1988. In laying out their strategies, the assigned capital stock committees drew extensively from the aforementioned sparse attempts to compute at least select elements of national wealth. This practice is separate from official surveys covering household assets (which have a longer history). Capital estimates were thoroughly upgraded based on the recommended norms of the 1993 and 2008 SNA. Therefore building stock-level accounts i.e the aggregate sum of land, capital and foreign wealth requires combining official statistics with representative surveys and historical studies in a systematic way for benchmark years. For flows of income and savings, I use official accounts where available and historical estimates of national income and savings otherwise. Most importantly, the timeline for data are relatively consistent; for example official series on national income were benchmarked based on the historical estimates by a few economists, thereby linking pre and post 1950 series. For capital stock, attempts by economic historians and statisticians appear to underpin official documentation. Similarly, the information from asset and debt surveys are crucial to the official updating of rents, income from property and information pertaining to the agricultural sector. The exact years for which complete information is used (for eg, wealth-income ratios) are critical benchmark years that coincide with official data mobilization efforts which themselves employed key studies specific to sectors or India's aggregate economy.

B.2 Step-by-step construction of wealth

Attempts by economists to construct elements of India's balance sheets were much more common until the 1970s because capital - independent of its ownership - was seen as integral to the development process. Early attempts and key references include Mukherjee and Sastry (1959), Mukherjee (1964), Roy (1967) and Goldsmith (1983). The earliest balance sheets for India were prepared by Atkinson (1902) as the colonial response to the debate on the "drain of Indian wealth" theory. Early estimates, i.e those prior to 1980 were focused on measuring tangible assets since these were more important than more modern intangibles. Following the 1993 SNA, back series (extended to 1981) were produced by official statistical agencies in India to account for intangibles such as software and art.

I adopt the following strategy: I follow Goldsmith's method of aggregating balance sheets by summing land, produced assets (structures & equipment, inventories & livestock) for each year and finally adding foreign assets (net) to arrive at national wealth. To this estimate I add gold

& silver in alternative estimates. These definitions are fully consistent with the SNA guidelines for estimating national wealth *with the emphasis* that these estimates may not exhaustive but certainly *within* what counts as wealth. Large scale changes in accounting standards (for eg intangibles) are adjusted³ in both national income and wealth. As long as the time series on the asset side does not count items absent from national income and saving flows, this serves as a good estimate of wealth-income ratios. The constraint to the frequency of these aggregate series is the availability of land estimates (dependent on official survey years).

B.2.1 National wealth

Land: Since land has always played a key role in Indian society (both for production and social hierarchy) its value has been of interest to officials over a very long period, dating back at least to British India. Colonial administrator's had developed their property rights system centered around land-holdings and derived much initial revenue from its output. The influence of Ricardo's theory of differential land rent was particularly strong (?) to price assessments in order to maximize revenues. As a consequence, knowledge about land prices and availability were very well documented; these are central to most agrarian or peasant studies by India's economic historians. Using land area calculations in Blyn (1966) with price reports, Goldsmith (1983) made estimates of the aggregate value of land for the period 1860-1913. The Blyn-Goldsmith estimate corroborates aggregate land values of Atkinson (1902) (adjusted for British administered vs Princely territory) for made only for 1875 and 1895. This same strategy was extended by Goldsmith using revenue records for until 1947. After the end of British rule, a series of land reforms deployed land area and price surveys in order to fully assess the degree of inequality between landlords and tenants inherited from colonialism. The Reserve Bank of India sponsored Rural Credit Surveys which were then used to make All-India land value computations for specific years by Mukherjee and Sastry (1959) and Mukherjee (1964) which match Goldsmith's 1950-70 independent estimates. These sources give me a time-series record of aggregate All-India land values (at current prices) until ⁴ 1960.

³Since SNA standards update both capital stock and national series, using the same base year (2011-12) series automatically adjusts for such changes

⁴Goldsmith makes a rough calculation for 1977 but I do not include these in the benchmark or alternative balance sheet

Starting in the 1970s, the RBI gave the responsibility of measuring household net worth to the National Sample Survey Organization (NSSO). The NSSO All India Investment Debt Surveys (AIDIS) thereafter computed the value of real estate as separate land & real estate values on a decennial basis. This extends the series until 2012. For the years 1981, 1991, 2002 & 2012 I directly computed the aggregate value of land from NSSO using average holdings (current price) of rural and urban land multiplied by the (respective) total households estimate in these reports.

[Table 1 about here.]

In the most recent 70th round, surveyors departed from previous methods by directly estimating land prices from registrar records. This may be the source of some upward bias in the trend joining 2002 and 2012. However much of the increased value of land is also confirmed by taking the RBI house price index which began in 2008 (see table above). This series shows a rise in the index even greater than the NSSO series (partially due to inclusion of structures). The main constraint for the frequency of balance sheets is in fact residential land, since it can only be observed for the years when AIDIS surveys were conducted.

Note that any estimates from land surveys are done exclusively for households. In official estimates, subsoil assets used for production by the public sector and corporations are measured in the capital stock of these sectors. In these measures land is not deemed to depreciate and investments in improvement are captured separate from investments in fixed assets. But no sources exist to isolate the value of land underlying buildings or structures owned by these entities for any prior year. Goldsmith imputed around this value to be 3% of household land for any year between 1860-1947 and assumed the same values thereafter (although excluding them for 1947-77). Most likely, through 1860-2012, land owned entirely by corporations and government (excluding non-marketable land such as for defense) is a very small fraction of aggregate land in India. Importantly, since over 90% of the workforce is absorbed into unorganized production (or almost 60% in agriculture), this more or less stays consistent with production land per worker in India. That is, much of households' land is also used in production.

Recent evidence for select years confirms that Goldsmith's assumption was fairly close to actual values. Following the 2003 Fiscal Responsibility and Budget Management Act, public entities were

required to compile asset registers⁵ where land underlying buildings and structures is listed. In 2012, the public sector disclosed ownership of around Rs 1.2 trillion worth of land⁶ which comes to about 0.5% of the estimated land value owned by households. The Ministry of Corporate Affairs has also begun compiling corporate balance sheets starting 2013-14 which includes the value of underlying land. Public limited companies (numbering 19,602) and private limited companies (292,308) owned respectively Rs 0.8 trillion and Rs 0.6 trillion worth of land on their balance sheet respectively. From these estimates, it is easy to ascertain that the total value of land compared to that of households in 2012 is less than 2-3%. But including these sectors' ownership is important for conceptual consistency. I therefore assume for all years between 1947-2012 that corporate and government land is 2% of household land.

Produced domestic assets: Capital stock series are available on an annual basis starting 1981 based on official sources. The Central Statistical Organization (CSO) lists a comprehensive manual, developed⁷ using 1993 SNA guidelines. All estimates are made using PIM type computations and the exact methods and guidelines are listed in the Chapter 26 CSO's NAS Methods and Sources (2012) manual.

Official estimates rely strongly on select post-independence studies of capital, benchmarking to estimates of capital stock made for 1950 and 1960 by Mukherjee and Sastry (1959) and Mukherjee (1964) respectively. To bring forward older estimates, the CSO uses a combination of the geometric depreciation series with adjustments⁸ to ensure physical capital stock has an exhaustible life. For lifespans, the CSO collaborates with several industrial agencies to compute annual life-tables of assets and allocates capital investment and stock to public, corporate and household (incl. NPISH) sectors. As mentioned before, no depreciation is computed for land used in the production process. Prices are upgraded using a combination of indices for different types and

⁵This is released as part of the Receipt Budget section of the Annual Union Budget

⁶Sensitive sectors are free from this disclosure and may own very substantial land but whether these assets should be considered tradable and hold market values is questionable in the first place.

⁷At least until 2012, the 1993 SNA system was the driving guideline for national accounts. This corresponds to UN SNA recommendations to develop estimates of national wealth.

⁸See pp 14 of NAS Methods and Sources. The depreciation formula for capital (K) with average life L is $K_n = K_0(1/L)(1 - (1/L))^n$. Until the 2007 series (extended backwards), the CSO was using straight line estimates of depreciation.

vintages of capital such as transport, construction, plantations, software, urban dwellings etc.

The key studies of historical capital stock are Atkinson (1902) and Roy (1967). Atkinson's balance sheet provides capital and livestock (crucial to agrarian capital) estimates for two years in the late nineteenth century (1875, 1895). For the first half of the twentieth century, Roy made detailed sector specific gross estimates of capital using PIM with appropriate price indices and censuses of joint-stock companies. The depreciation for these sectors was updated by Goldsmith (1983). Goldsmith also provides an estimate for 1860, using admittedly less precise methods but still important to give a sense of magnitude relative to national output. I use these studies and official estimates to provide a long run (1860-2012) series on net domestic capital stock, all of which are measured (by definition) at book-values.

of which Corporate capital: A brief note on corporate capital is in order. Despite a long (partially interrupted) tryst with corporate capital going back to British era joint-stock companies, much of Indian business is still closely held family based corporations. The ratio of public to private limited companies is around 6% according the asset registers of the Ministry of Corporate Affairs in 2013-14. The challenge to build proper balance sheets for the corporate sector is immediately apparent by the fact that the authorities cannot even count⁹ the total corporations in operation. Accordingly, in my measures of national wealth, I do not follow traditions in the recent literature on wealth-income ratios which measures corporate wealth using the equity holdings of households. First, information on equities is very limited and households themselves do not hold much financial equity in their portfolio. Were there available household balance sheets at regular frequency, then it would have been potentially feasible to measure market (rather than book) value national wealth. This means the long run corporate capital series - itself a combination of historical and official estimates - is measured entirely at book value. At the very least this provides consistency between these different data sources and prevents a bias in the size of corporate net worth from switching¹⁰ to market values at some period. This ensures that my measure of national wealth follows precise SNA guidelines. The book value also has the advantage that it can measure

⁹For example, there is no estimate of the total number of companies operating with the Registrar of Companies. See <http://mospi.nic.in/121-corporate-sector>

¹⁰In a similar case for China, Piketty et al. (2017) used mixed methods by benchmarking to book value in the past but updating using market value when they became available

inventories easily and since these have a high rate of turnover, prices are captured at their most recent values.

Two potential difficulties with using book values are (1) Imprecise estimate of the size of the corporate sector and (2) capital losses. In each case, based on statistical evidence there is sufficient robustness in the measured size of corporate capital from official PIM type series. Regarding (1) market and book values will converge when Tobin's Q equals 1. For listed equities in the 1950s, Mukherjee (1964) found the market-book value ratio to be around 1. Khanna and Palepu (2005) find Q to be around 1.1-1.2 in the 1990s. Therefore for much of the historical period, it is unlikely that book values over-estimate the size of the corporate sector. If anything, the bias maybe downwards. Figure 1 compares stock-market capitalization for listed companies with book value capital of public enterprises and private joint-stock companies. Note that listed companies are a fraction of the entire corporate sector. Market capitalization was very low in the period leading to India's market reforms and subsequently accelerated measuring well above the book value of the full corporate sector on the eve of the global financial crises; It is obvious that Tobin's Q was well above 1 between 2005-2009 even adjusting for the increased presence of public limited companies on Indian stock markets. Trends in book values are much more stable, consistent with the slow and steady rise of financial savings of households. Had the purpose of this article been the estimation of the distribution of private wealth, then market values would have been preferable and consistent with equity information disclosed in tax returns.

On (2), the book value measure would create a bias if a larger fraction of firms were going out of business than newly incorporated business. In this case, past investment flow would continue to cumulate and fail to account for real capital losses. In reality, Indian bankruptcy laws (only updated in 2016) were too inflexible regarding business assets and it was very difficult to realize bankruptcy claims in much of the twentieth century. Accordingly, the fraction of firms going out of business¹¹ is less than 5% of newly registered companies on an annual basis. Basically, much more companies enter than those who exist, with the bankruptcy law ensuring that the latter's capital sits on the balance sheet of financial enterprises for long periods as a non-performing asset. As Figure 1 shows, the trend in book value corporate capital is not explosive in the post 1990s period of high private sector expansion. Of course as Asset Registers of corporations are collected annually for

¹¹See the chapters on joint-stock companies in the Statistical Abstracts of India for 2004, 2007 and 2012

a long enough period (including back series) then it may be possible to produce more precise capital estimates in the future.

[Figure 1 about here.]

Foreign asset position: Foreign wealth estimates are computed for 1970-2011 using the updated and extended dataset constructed by Lane and Milesi-Ferretti (2007). To convert to Indian Rupees I use mid-year exchange rates in benchmark calculations. The figure for 2012 is taken from India's official International Investment Position (IIP) published by the RBI. Data are provided in the supplementary database on an annual basis. For previous years, net foreign assets are computed from Tables 2-40 of Goldsmith (1983) who used RBI bulletins and statistical abstracts to make his calculations.

The entire benchmark national wealth series is summed up below

[Table 2 about here.]

B.2.2 Public sector

[Figure 2 about here.]

In the supplementary database I provide components of the public sector balance sheet for the 1951-2012 period. The public sector comprises general government (union and state) plus financial and non financial state enterprises. Enterprises are also classified in the national accounting system as departmental and non-departmental undertakings with the latter maintaining its own separate accounts i.e functioning as an autonomous corporate entity. General government at all levels functions through three main accounts (Figure 2): Consolidated funds whose use requires legislature voting, public accounts (no voting necessary) and contingency funds (emergency uses). In the ideal case, all financial wealth of general government should be observable were these accounts built systematically as balance sheets. Official government accounting presents many challenges. The annual budgets of the government disclose a statement of assets and liabilities for audit by the Comptroller and Auditor General of India (CAG)¹² under the head of the "Receipt budget." Since the auditor is only interested in tracing annual flows in the financial

¹²Reports are published online at <https://cag.gov.in/combined-finance-and-revenue-accounts-and-union-state>

statement, the synthetic balance sheet is made on the basis of cash flows rather than accrual basis. Accordingly, the largest asset element - capital outlay on general, economic and social services - is calculated by adding up past investment flows unadjusted for replacement values and depreciation. While this adequately captures loans and advances (given out or incurred), the aggregate government wealth picture is quite incomplete. Some of the early attempts to produce an assets and liabilities statement (Dandekar, 1994) suffer from improper valuations of the government's net financial liabilities.

General government entities also hold substantial equities which only recently are becoming disclosed in mandatory asset registers, released in the annual budget. Only with complete and updated accounting of non-financial and net financial assets can government wealth be properly computed. Outside of core government, public wealth also requires the balance sheets of all autonomous public enterprises whose balance sheets are not available. The main data which is available is the net capital stock of the entire public sector (split into administration and enterprises). I combine available information such as internal and external public debt, capital outlays (from the annual budget) and capital stock as part of the public balance sheets but do not attempt a full government or public sector balance sheet. For the 1951-2012 period, the IMF now produces debt estimates (Abbas et al., 2011) following the accrual system which serves as the benchmark public debt measure. Taking the size of outlays, capital and debt at least gives a general idea of the direction of public wealth - debt is rising faster than capital outlays and non-financial assets. The main balance sheet elements I provide are the following:

1. Public capital: Net capital stock of administrative government and enterprises (departmental and non-departmental). Annual basis from 1981-2012.
2. Administrative and Departmental Capital: (1) less the capital stock of non departmental enterprises. Annual basis from 1981-2012.
3. Central government; General social and economic capital (cash flow accumulation): Select years from 1951-1985, annual basis from 1985-2012.
4. Central government; Financial loans: Select years from 1951-1985, annual basis from 1985-2012.

5. Central government; External and Internal Debt: Select years from 1951-1985, annual basis from 1985-2012.
6. General government; Public Debt (accrual method from Abbas et al. (2011)), annual basis from 1951-2012

B.3 Step-by-step construction of flows

National income: Data on national income is available on an annual basis starting 1900. I use national income figures from Sivasubramonian (2000) for 1900-46. For the years 1860, 1875 and 1895 I draw on Goldsmith's Gross National Product estimate and deduct 10% as depreciation (as per his assumption). Starting 1950 I use CSO's Net National Income from official national accounts. The intermediate years 1947-1950 are linearly interpolated. All aggregates are in Indian Rupees at current prices. When computing wealth-income ratios, the benchmark series for the 1900-2012 period makes one adjustment. To reduce sensitivity of the national wealth measure (which is only for specific years) for any year t , I take the average national income for years Y_{t-1}, Y_t, Y_{t+1} in the denominator.

Prices: To compute real income and wealth, I use the national income deflator using constant price national income for the 1900-2012 period with 2012=100. To get one consistent series I spliced constant price national income from Sivasubramonian and CSO's official measures.

Consumption of fixed capital: I use Sivasubramonian's depreciation estimates for 1900-46 and official CSO estimates at the national and institutional level for 1950-2012. The final series are in current prices on an annual basis.

Savings: Savings at the national level are computed throughout as the sum of net-of-depreciation capital formation plus net foreign investment. This exact calculation for the years 1900-46 is done by Maddison (1992) but using older national product estimates of Sivasubramanian. I continue to use Maddison's saving rate but for aggregate savings until 1946, I used this net saving rate with Sivasubramonian's updated back-series. For the independent era post 1950, I computed savings at the national level using net capital formation and foreign investment. To split into public and

private savings requires combining some more data. This is because the CSO uses a less-than-robust method to divide savings into household (& NPISH) financial lending and non-financial saving by taking physical accumulation as a residual (i.e total less public & corporate accumulation). However private savings can be derived indirectly using proper accounting of financial and non-financial flows. Capital finance and flow of funds information is unusually good¹³ for the post-independent period.

Private (public) saving is the sum of net private (public) capital formation plus net private (public) lending. Since national saving is the sum of private and public saving, either of the components can be derived by removing one component from national saving. The CSO maintains historical series on capital finance of the entire public sector starting 1949. These series are split into accounts for 1949-62, 1961-75, 1981-2012. For 1949-62, capital finance accounts are aggregate for the public sector. The 1961-75 series distinguishes general government from public enterprises and subsequent series distinguish financial flows from railways, communications, other general government, financial and non-financial enterprises. Net lending/borrowing is calculated from these series by deducting all financial flows from expenditures and transfers of the public sector. Accordingly, private saving is calculated as:

$$\begin{aligned} \text{Private saving} &= \\ &\text{Net capital formation} + \text{Net foreign investment} \\ &- \underbrace{\text{Net public capital formation} - \text{Net public lending}}_{\text{public saving}} \end{aligned}$$

These institutional flows are not used in any decompositions of wealth because wealth cannot be split into institutions but are useful supplements providing information on finance and capital formation by the public sector.

B.4 Gold & silver: alternative series

One particularly important and relatively unique category of wealth for India is precious metals and the national appetite for holding wealth in gold and silver has a long history. This importance is underlined by the detailed efforts made by Atkinson (1902) to trace and speculate the stock of gold in India since the first invasions by Alexander the Great in 326 BC. Until independence in

¹³See Narayan et al. (2017) for a detailed analysis of Indian flow of funds

1947, due to unrestricted imports of gold, Atkinson's numbers were updated by Goldsmith (1983) and combined with other bulletins to compute proportions of gold & silver in India's national wealth. Subsequent values of the gold and silver stocks are however speculation since imports of Gold were banned between 1947 and 1992. This by no means implies that precious metals were not imported illegally and indeed in large quantities since AIDIS surveys still show a large portfolio weight dedicated to gold. In particular, Goldsmith used prices on the Bombay market which are recorded by the RBI and obtained estimates until 1975. In the following years, the World Gold Council provides some approximations (Bhattacharya, 2002). In between, studies have tried to use econometric models to predict possible imports of gold but not silver (Vaidyanathan, 1999). The AIDIS also records households' stocks of gold but excludes silver. Additionally, unlike land which is at least visible there is quite a large possibility of under-reporting actual holdings of precious metals. Therefore compared to other categories of national wealth, estimates are far too unreliable and thus I use a range of scenarios until 2012 to compute gold and silver on the national balance sheet. When reporting national wealth-income ratio by component I use Scenario 1. The different scenarios are computed using the following methods:

- Scenario 1 (lower bound): Gold is assumed to be 80% of gold and silver stock in 1975. The stock of both metals is fixed (in kg) at the national level and prices on the Bombay markets are used to measure appreciation of gold and silver. This obviously assumed the stock of gold does not flow in or out of the country and all scrap is recycled into new stocks of gold.
- Scenario 2 (intermediate range): Starting from the initial stocks in 1975, the compounded annual growth rates between 1975 and 2012 are used to interpolate total value of these precious metals. The value of gold and silver in 2012 is assumed to be the reported aggregate in AIDIS taken from Badarinza et al. (2016).
- Scenario 3 (upper bound): For gold, interpolate 1975 to 2002 and 2002 to 2012 using tonnage estimates of the World Gold Council. Silver stock is held constant and only price changes are computed from year to year. To compute values, I use annual (averaged) prices of gold & silver on the Bombay (Mumbai) markets from the RBI.

B.5 Classification of all series

In total I produce 5 different estimates of the national wealth-national income ratio β in the supplementary database. These classifications along with other computations described previously are listed below.

- **National wealth:** Current prices, Indian rupees, book-values. Specific years from 1860-2012
Benchmark series: Land + Domestic Produced Assets + Net Foreign Assets.
Alternative series: Benchmark series + Scenario 1, Benchmark series + Scenario 3, Benchmark series + Scenario 3
- **National income:** Current prices, Indian rupees, Annual from 1900-2012. Specific years from 1860-1895
Net domestic output + factor income from abroad.
- **Savings:** Current prices, Indian Rupees. Annual from 1900-2012
Net national savings: Net domestic capital formation + Net foreign investment
Public savings: Annual from 1951-2012. Net government capital formation + net lending
Private savings: Annual from 1951-2012. Net national savings – Public savings
- **Wealth-income ratios:** National wealth/National income ratio.
Strategy 1 (*benchmark wealth-income ratio*) : Benchmark wealth & National income average for years $t - 1 : t + 1$ for 1900-2012
Strategy 2: Benchmark wealth & National income
Strategy 3: Benchmark wealth + Gold & Silver Scenario 1 & National income average for years $t - 1 : t + 1$ for 1900-2012
Strategy 4: Benchmark wealth + Gold & Silver Scenario 2 & National income average for years $t - 1 : t + 1$ for 1900-2012
Strategy 5: Benchmark wealth + Gold & Silver Scenario 3 & National income average for years $t - 1 : t + 1$ for 1900-2012

[Figure 3 about here.]

B.6 International comparison series

To make cross country comparisons, I use comparable wealth-income ratios for five other countries. All series are net national wealth-national income ratios sourced directly from wid.world using the Stata ssc package **wid**. Countries have different years of coverages based on the original articles where these series originally appeared. Those used in comparisons are China (1978), Japan (1970-2012), United Kingdom (1860-2012), France (1870-2012) and the United States (1870-2012).

B.7 Raw files

Raw files used to compute all series have been provided in the supplementary database. All calculations are replicable using formulas given in the spreadsheet. These also list the link (or reference) to the source for data.

C Decomposition equations

C.1 Benchmark decompositions

Since wealth changes over time for a variety of reasons, it is important to distinguish between the standard capital accumulation style equations versus other price/residual effects. Basically, one has to account for sources behind *real* growth of wealth $1 + g_w = W_{t+n}/W_t$. Depending on how asset prices enter the law of motion, wealth accumulation equations can be written in additive versus multiplicative forms. The latter is more useful in explaining sources of wealth accumulation in the long run. For example, if the question of interest is what explains the dynamics of wealth accumulation over (say) a hundred year period then the multiplicative form is more suitable (the additive form tends to overemphasize recent years). All decompositions begin starting 1913 because national income and saving/investment flow series are complete only after 1900, while 1913 is the first available estimate of national wealth for the years after 1900.

Additive decomposition: In this version, wealth evolves according to the following equation:

$$W_{t+n} = \underbrace{W_t}_{\text{Initial wealth}} + \underbrace{S_{t,t+n}}_{\text{Cumulated savings}} + \underbrace{KG_{t,t+n}}_{\text{Cumulated capital gains}} \quad (1)$$

In the case where asset prices exactly evolve with consumer price inflation then wealth in each subsequent period is simply the sum of initial wealth and cumulated savings - the pure capital accumulation story. Since the accumulation of capital and wealth takes time, this method is particularly useful for estimating the importance of initial wealth in the short/medium run. The second advantage with this method is that national income and savings are usually available on a regular (annual) basis whereas wealth estimates are less frequent. The evolution of the wealth-income ratio can be written as:

$$\begin{aligned}\beta_{t+n} &= \beta_{\text{Initial}} + \beta_{\text{Savings}} + \beta_{\text{Capital gains}} \\ &= \frac{W_t}{Y_{t+n}} + \frac{S_{t,t+n}}{Y_{t+n}} + \frac{KG}{Y_{t+n}}\end{aligned}$$

I proceed as follows. If wealth estimates are available for (say) two benchmark years, Year t and Year $t+n$, then by cumulating savings between these years I account for the initial wealth and cumulated savings portions. Capital gains are taken as the residual i.e the difference between β_{t+n} and $(\frac{W_t+S_{t,t+n}}{Y_{t+n}})$. As the gap between two periods is increased, initial wealth matters less because by definition $\beta_{\text{initial}} = \frac{\beta_t}{(1+g)^n}$ so that as n increases, the importance of initial wealth decreases.

Multiplicative decomposition: The multiplicative law of motion is the following:

$$W_{t+n} = (W_t + s_t Y_t)(1 + q_{t+n}) \quad (2)$$

By transforming this equation into wealth-income ratios the growth rate of wealth can be split into $g_{ws} = s/\beta$ (savings driven growth) and q (capital gains driven growth of wealth). For national income growth rate g , the multiplicative equations denote the evolution of wealth-income ratios as:

$$\beta_{t+n} = \beta_t \frac{1 + g_{ws}}{1 + g_{t+n}} (1 + q_{t+n}) \quad (3)$$

To decompose the growth of wealth between two years t and $t+n$, I proceed by computing first a weighted saving rate $s_{t,t+n} = \frac{\sum_{i=t}^{t+n-1} s_i Y_i}{\sum_{i=t}^{t+n-1} Y_i}$ so that $g_{ws} = s_{t,t+n}/\beta_t$. Using constant price wealth and income growth rates, one can use the following equation to derive the uniform rate of capital gains as a residual:

$$q = \frac{1 + g_w}{1 + g_{ws}} - 1$$

That is, q is that portion of the growth of wealth which is not explained by new savings between years t and $t+n$. Obviously, $q = 0$ if $g_w = g_{ws}$, as in the one-good capital accumulation case.

Although it is assumed usually that capital gains disappear at the steady state, this need to be the case empirically if there are structural deviations due to limited assets (such as land). It is perfectly possible to have capital gains persist in the long run, if $q < g$ and $\beta_t = \beta_{t+n} = \beta^*$ so that $\beta^* = \frac{s(1+q)}{g-q}$ - this is discussed in the appendix of Piketty and Zucman (2014). In the additive case, it was possible to imagine a scenario where the wealth-income ratio increases but there are no savings. But even allowing capital gains, the multiplicative form requires at least some savings. That is, in the long run, savings always explain most of wealth accumulation because with $s = 0$, $\beta^* = 0$.

C.2 Decompositions: alternative series

In Tables 6 B, C and D of the supplementary database, I provide the same decompositions for alternative scenarios once gold & silver computations are added to the benchmark wealth-income ratio. The only difference between the benchmark and alternative series is in the numerator of β because W is greater. Depending on the aggregate value of precious metals relative to national income, the contributions of saving and capital gains will differ from benchmark estimates. The interested reader may explore the associated spreadsheet for these tables.

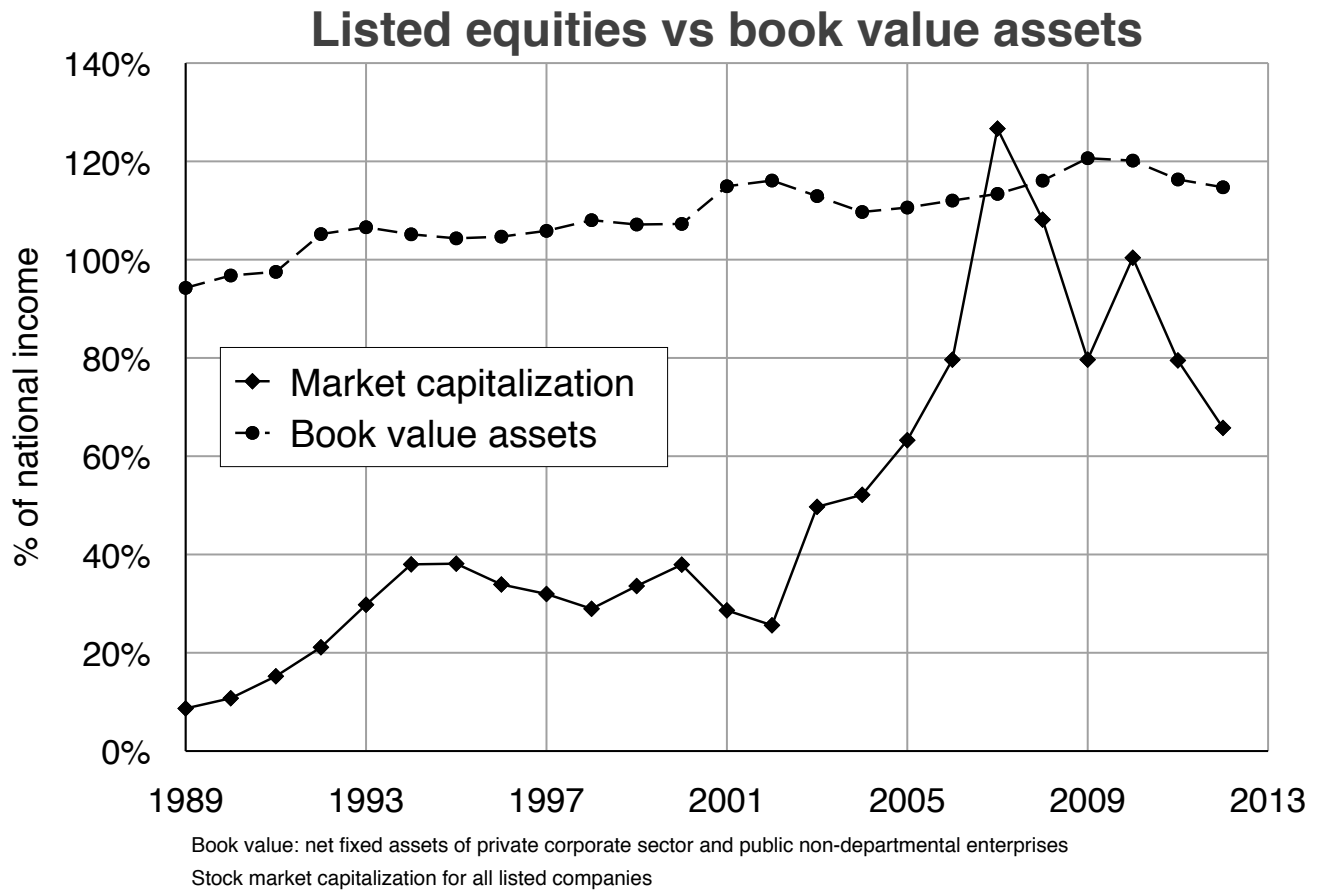
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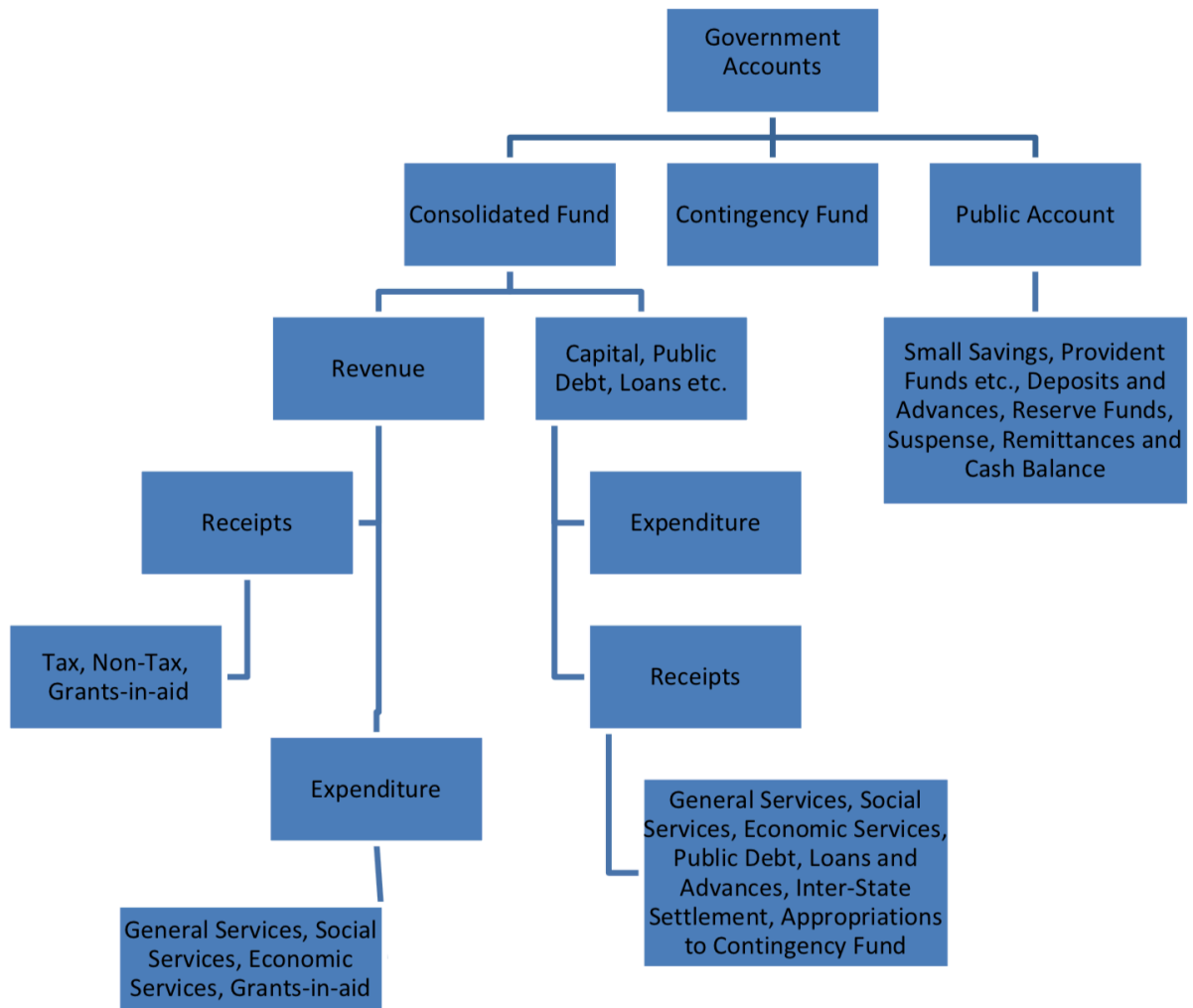
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Source: Author's computations in Supplementary Database Table 2B

Figure 1: Value of listed equities on domestic stock exchanges and book value corporate capital - fixed assets of corporations (private joint-stock and public enterprises not fully controlled by government)

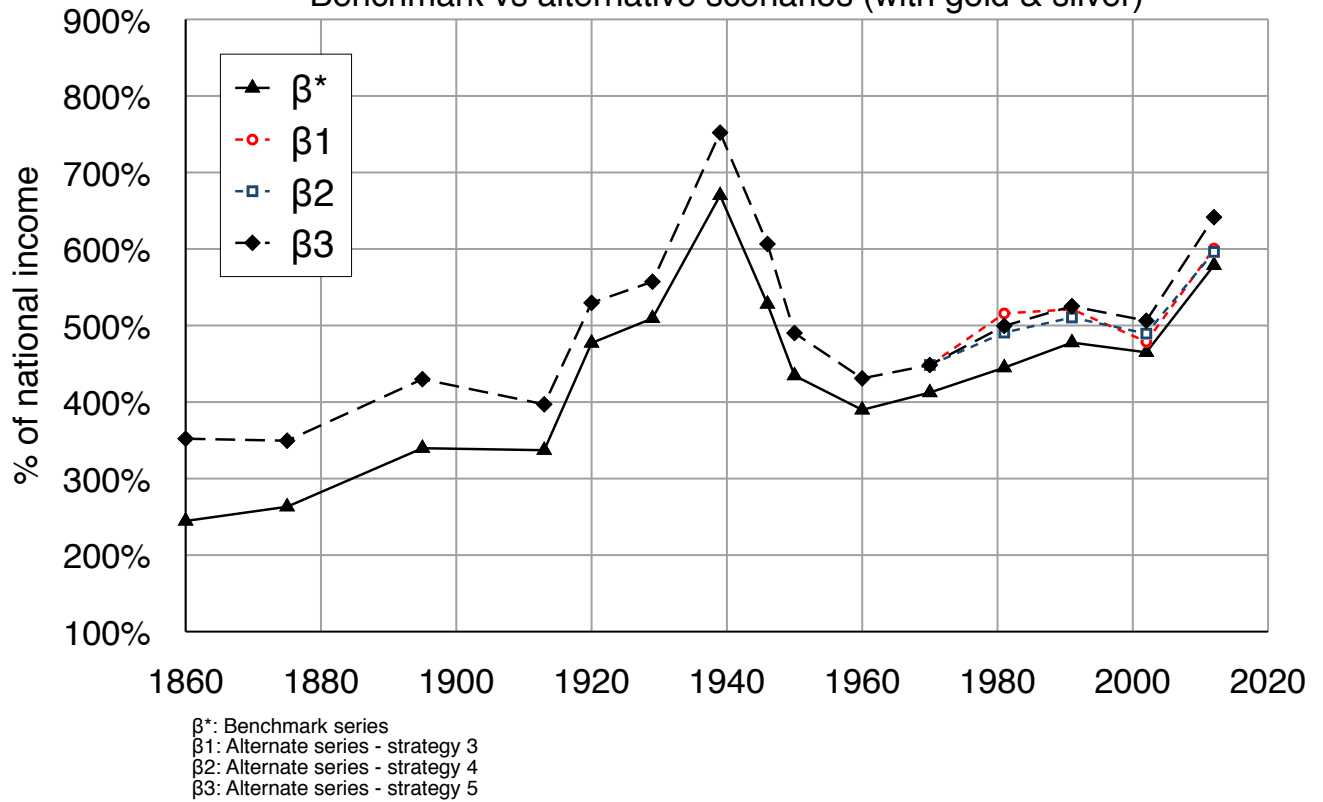


Source: Comptroller and Auditor General of India. Link: cag.gov.in

Figure 2: Structure of Indian general government accounts: Consolidated Funds, Contingency Funds and Public Accounts

The evolution of national wealth

Benchmark vs alternative scenarios (with gold & silver)



Source: Author's computations in Supplementary Database Table 3B

Figure 3: Alternate wealth-income ratios (including Gold & Silver) compared with benchmark series.

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	Year	RBI House Price Index	AIDIS Land Prices
1	2008	100.00	100.00
2	2009	118.50	126.10
3	2010	248.30	159.00
4	2011	311.00	200.49
5	2012	372.00	252.81

Table 1: Comparison of prices series (2008=100): RBI real estate (land and buildings) vs AIDIS (extrapolated) land prices. AIDIS trend extended at annual CAGR from 2002 to 2012.

National wealth <i>equals</i>	Land	Produced Assets	Foreign Assets (net)
<p>1860-2012: Specific years using summary tables in Goldsmith & NSSO AIDIS (<i>average value of land per household x total households</i>). For 1947-2012 imputes land owned by government and corporations at 2% of household land. Current prices in Indian Rupees.</p>	<p>1860-1970: Specific years using summary tables in Goldsmith & Mukherjee & Sastry. Produced assets = Structures & equipment + Inventories + Live-stock. Consumer durables excluded. Book values. Current prices in Indian Rupees.</p>	<p>1860-1960: Specific years using summary tables in Goldsmith. Current prices in Indian Rupees.</p>	
-		<p>1981-2012: Annual. Using CSO official capital stock series. Produced assets = Net domestic capital stock (fixed assets + inventories). Consumer durables excluded. Book values. Current prices in Indian Rupees</p>	<p>1970-2012: Annual using series in Lane & Milesi-Ferreti, and also official IIP from RBI (2012). Indian Rupees at mid-year exchange rates.</p>

Table 2: National wealth (benchmark calculations). Frequency, definitions and sources