A Data

This section of the Appendix describes the construction of our dataset and quantifies how it differs from pre-compiled and easy to obtain databases. We also discuss important national accounting issues such as which categories are included in our category “Other Payments to Capital,” and what is the difference between “Corporate Saving” and “Corporate Gross Disposable Income.”

We obtain our annual data on income shares, saving, and other variables at the national and sector levels by combining six broad sources: (i) country-specific Internet web pages; (ii) digital files obtained from the UN covering their series 100, 200, 300, 400, and 500; (iii) digital files obtained from the OECD and covering their tables 13 and 14; (iv) a separate database compiled in the mid-1990s by researchers at the World Bank (see Loayza, Schmidt-Hebbel, and Serven (2000)); (v) physical books published by the UN; and (vi) physical books published by the OECD. We start by using the information obtained from the Internet since that is a primary source and contains the most up-to-date information reflecting revisions and corrections. We then rank all remaining sources other than the World Bank database (since it is not a secondary source) by the amount of years of complete data they contain and use these sources in order to add data when the higher priority source does not contain the data. Finally, we fill in any remaining missing variables using the World Bank database.

Figure A.1 plots the percentage of country-year observations in our data, both unweighted and weighted by corporate saving, that cannot be obtained simply from the digital files of the UN and the OECD. Our dataset is more comprehensive relative to the dataset that would be easily obtained from the UN and the OECD, particularly prior to the mid-1990s. For example, before 1990, our dataset increases the number of observations by approximately 100 percent when observations are unweighted and by approximately 40 percent when observations are weighted by
corporate saving.

If information is available directly from the source at the corporate sector level, as opposed to separately for financial and non-financial corporations, we use the more aggregated data. If needed, though, we simply add the values for financial and non-financial corporations. Similarly, we first see if information is available directly from the source that combines the household sector with the non-profits serving households sector but otherwise add the disaggregated categories. If a country only has information on households, we use that to represent the entire household and non-profit sector (the latter is always quite small). Frequently, accounting identities will allow us to impute variables that are not directly provided. For example, for some countries we build gross corporate investment by adding net corporate investment and corporate consumption of fixed capital (depreciation). In others, we might back out corporate depreciation by subtracting net corporate saving from gross corporate saving. There is only little variation across countries in the ratio of corporate taxes on production to corporate gross value added. Therefore, in the few instances when this tax rate or corporate gross value added is missing from a country’s data, we use the median global tax rate to impute the missing value. Once obtained, we can use the imputed taxes on production to impute, for example, corporate gross operating surplus from the original data on corporate gross value added and corporate compensation of labor. We hope to ultimately make public our constructed sectoral national accounts database but upon request we will provide the exact details of any imputation used in the paper.

We convert all variables into current U.S. dollars using the average annual market rate obtained in the International Financial Statistics database provided by the International Monetary Fund (and the Global Financial Data database for Taiwan). After running this algorithm, we include all possible countries in our analysis with sufficient data except for Argentina, Armenia, Azerbaijan, Brazil, Bulgaria, Greece, Kazakhstan, Kyrgyzstan, Moldova, Mozambique, Peru, Turkey, and Venezuela. These countries had displayed obviously identifiable problems in our merged data that we could not fix, likely stemming from unrepresentative exchange rates during periods of hyperinflation.

“Corporate Saving” is also often referred to as “Corporate Gross Disposable Income.” More precisely, corporate saving equals corporate gross disposable income less than corporate final consumption expenditures, which are generally equal to zero. These two variables, often listed separately in the National Accounts, are generally equal to each other. Occasionally, however, these will differ due to adjustments made for the change in net equity of households in pension funds. In such cases, we distribute half of this discrepancy to each of corporate gross saving and corporate gross disposable income such that their values are always precisely equal in our dataset.
(we do the same for the household and government sectors). Relatedly, there are occasional differences in the depreciation implied by the difference between gross and net saving in a sector and the difference between gross and net disposable income in that sector. Again, in such instances, we simply take the average value for depreciation.

As shown in Figure 3, we divide corporate gross value added into three categories that are directly found in the national accounts plus a fourth residual category we call “Other Payments to Capital.” This category primarily consists of taxes on production and interest payments on loans obtained from banks. Taxes on production (referred to in the national accounts as “other taxes and subsidies on production”) are different from taxes on products (which typically consist of VAT, sales taxes, or import tariffs/subsidies) and include taxes on the ownership or use of land, buildings, or other structures utilized by enterprises in production, taxes on the use of fixed assets (vehicles, machinery, and equipment) for purposes of production, taxes on the total wage bill and payroll taxes, and taxes on international transactions for purposes of production, among other taxes. Other categories included in “Other Payments to Capital” include reinvested earnings on direct foreign investment, property income attributed to insurance policyholders, and rent on land and sub-soil assets.

B Robustness of Empirical Results

This section of the Appendix demonstrates the robustness of our primary empirical findings to alternative methods for constructing our dataset. In particular, we consider three alternative assumptions used in assembling the data. First, we consider using multiple sources, but requiring that a “smooth pasting” condition holds before adding data from a second (or third, etc.) data source. Next, we create our dataset using only 1 source per country, rather than concatenating multiple sources as in our baseline algorithm. Finally, we report results from a dataset which only includes the non-financial subset of the corporate sector.

B.1 “Smooth Pasting”

We start by constructing an alternate dataset using an algorithm similar to our baseline method, but only concatenating data from one source with data from the next-ranked source if a “smooth pasting” condition is satisfied. For example, imagine the Internet data for a given country covers the years 1995-2007 and OECD data covers 1985-1999. In this alternative algorithm, we would compare data values for 1995, since that is the earliest year with data from both sources. If the discrepancy between sources for that year exceeds some threshold value, we do not use the
OECD data. If the data values for 1995 are sufficiently similar, we do grow the Internet data back using the OECD to generate coverage from 1985-2007 (before then considering a third source). This percentage threshold is variable-specific and is defined relative to that country’s GDP. For example, if the variable is corporate gross saving, our requirement is that the discrepancy between sources not exceed 1 percent of GDP. Other categories that are bigger or smaller have smooth pasting thresholds that are bigger or smaller.

Figure A.2 shows estimates from this alternatively constructed data set. The upper panel plots the equivalent of Figure 1, which constitutes our primary empirical finding, from this alternatively constructed data set. The 1975 and 2007 values for both the global corporate labor share and for corporate saving relative to total global saving are nearly unchanged compared to the values in our baseline dataset. As a result, the two primary trends we identify are also essentially unchanged and are, if anything, a bit smoother. The prevalence of these two patterns within-country are also essentially unchanged with this alternative dataset construction compared to our baseline dataset. For example, the middle and the lower panel of Figure A.2 demonstrate again that a large majority of countries experience declining trends in their corporate labor shares and increases in the share of their saving originating in the corporate sector. With this dataset construction, 7 of the world’s 8 largest economies experience labor share declines and all 8 have growing corporate saving shares. Finally, the cross-sectional coefficients on the relationship between trends in labor shares, trends in corporate saving shares, and trends in relative investment prices which we used to calibrate our model are not significantly changed with this alternative construction of our dataset. With this data, the coefficient for labor share equals 0.18 and for corporate saving equals -0.59. These are close to the baseline values of 0.21 and -0.46.

**B.2 Single Source per Country**

We construct an alternative dataset using only one source per country. This differs from our baseline algorithm in two ways. First, it no longer makes the Internet the first source for data and will instead use whichever source has the most data for each country (though we continue to use the World Bank dataset only in the absence of other data). Second, even if we could augment this first source with data from a second, we do not. This insures that results do not stem from jumps created by concatenating one source’s data with that from another.

Figure A.3 shows estimates from this alternatively constructed data set. The upper panel plots the equivalent of Figure 1, which constitutes our primary empirical finding, from this alternatively constructed data set. The 1975 and 2007 values for both the global corporate labor share and for corporate saving relative to total global saving are nearly unchanged compared to the values in our
baseline dataset. As a result, the two primary trends we identify are also essentially unchanged. Though the corporate saving share line continues to smoothly increase, the labor share plot now becomes significantly more jagged. This reflects the fact that now there are far fewer countries included in the early years of the plots. As important countries are added to the data, this compositional change produces jumps in the figure. As with the first alternative dataset, the middle and the lower panels of Figure A.3 constructed with this second alternative demonstrate again that a large majority of countries experience declining trends in their corporate labor shares and increases in the share of their saving originating in the corporate sector. With this dataset construction, all 8 of the world’s largest economies experience labor share declines and 7 of the 8 have growing corporate saving shares. The cross-sectional coefficient for labor share now equals 0.12 and for corporate saving equals -0.49, similar to the baseline values of 0.21 and -0.46.

B.3 Only Non-Financial Corporations

We construct an alternative dataset that only uses information from the non-financial corporate sector. If a country only lists data for the integrated corporate sector (financial plus non-financial), we omit it. This insures our main results do not stem from changes specific to financial firms, since our model and mechanism is more relevant for the non-financial sector.

Figure A.4 shows estimates from this alternatively constructed data set. The upper panel plots the equivalent of Figure 1, which constitutes our primary empirical finding. This plot exhibits a somewhat stronger decline in the labor share of nearly 10 percentage points. This reflects the fact that the labor share decline is smaller in the financial sector than in non-financials. More broadly, however, the baseline patterns are preserved and, if anything, amplified. The middle and the lower panels of Figure A.4 constructed with this third alternative demonstrate again that a large majority of countries experience declining trends in their corporate labor shares and increases in the share of their saving originating in the corporate sector. With this dataset construction, 7 of the world’s 8 largest economies experience labor share declines and all 8 have growing corporate saving shares. The cross-sectional coefficient for labor share now equals 0.19 and for corporate saving equals -0.58, quite close to the baseline values of 0.21 and -0.46.

B.4 Trends in Corporate Labor Share and Corporate Saving

Figure A.5 shows alternative estimates of trends in corporate labor shares and saving shares. The upper panel shows estimated time fixed effects from regressions of corporate labor shares and corporate saving as a share of total saving on country and time effects using data on only the 8
largest economies. The lower panel shows the estimated time fixed effects from similar regressions in the sample of all countries with at least 10 years of data. The regressions weight countries by their GDP in each year.

Figures A.6 shows that the majority of countries in our data either experienced both a decline in their labor share and a rise in corporate saving, or experienced the reverse. The upper panel plots the change in corporate saving to GDP against changes in the labor share and shows that of the 34 countries with more than 10 years of available data, 23 are in the top-left or bottom-right quadrant, including 7 of the 8 largest economies. 19 of the 34 countries in the lower panel, also including 7 of the 8 largest economies, experienced declines in the labor share and increases in corporate saving, or the reverse.

Finally, Figure A.7 shows corporate, household, and government saving relative to global GDP. The figure shows that corporate saving increased significantly relative to GDP, and given that household saving declined and government saving were stable relative to GDP, it also implies a large increase in the share of the corporate sector in total saving $S$. As in Figure 1, we convert sector saving and GDPs into U.S. dollars and add these up across our unbalanced panel of available countries. Therefore, the trends in Figure A.7 disproportionately reflect trends in larger countries.

B.5 Further Robustness Exercises for Corporate Labor Shares

First, in Figure A.8 we use GDP weights to aggregate country-sector specific data on labor shares collected by the OECD and verify that the labor share declined globally between 1975-2007 in all of the sectors for which they provide data. These non-overlapping sectors are “Manufacturing,” “Trade, Transport, and Communications,” “Construction,” and “Finance and Business Services.” Changes in the sectoral composition of the global economy, at least at this aggregated level, cannot alone explain the decline in labor shares. The declines are particularly strong within manufacturing and trade, transport, and communications. The sectors without labor share data are agriculture, mining, utilities, and real-estate.

Second, we repeat our analysis of trends in corporate labor shares and trends in price of investment goods presented in Figure 6 when we limit the set of countries to include only those with 15 years of data. In that case, the sample drops from 48 to 27 countries, with mostly smaller countries exiting the sample. The cross-sectional coefficient is 0.19 and the median across countries time series coefficient is 0.18.

Third, we repeat our analysis of trends in corporate labor shares and trends in price of investment goods presented in Figure 6 in the EIU data. We again find a highly significant estimated cross-sectional slope of 0.26. The median across countries time series coefficient is 0.31. We show
these in the upper panel of Figure A.9.

Fourth, in the main text we have used the relative price of investment goods as a proxy for changes in the user cost of capital. As an additional check, we have repeated our cross-sectional regressions of trends in corporate labor share and on OECD measures of the combined corporate income tax rate. These estimates are presented in the lower panel of Figure A.9. We do not use OECD data on wages because it leaves us with less than 10 countries with sufficient data, and we do not use data on movement in real interest rates because they are extremely volatile for many countries due to changing risk premia associated with government borrowing.

B.6 Further Robustness Exercises for Corporate Saving Shares

First, we repeat our analysis of trends in corporate saving shares and trends in price of investment goods presented in Figure 8 to the set of countries with more than 15 years of data. The number of countries shrinks significantly down to 28. We find a cross-sectional coefficient of -0.18 and a median across countries coefficient of -0.47.

Second, we repeat our analysis of trends in corporate saving shares and trends in price of investment goods presented in Figure 8 in the EIU data. We find a cross sectional coefficient of -0.20 and a median across countries time series coefficient of -0.49 (though these estimates have larger standard errors). These results are shown in the upper panel of Figure A.10.

Third, replacing the trend in the relative price of investment with the trend in corporate tax rates as a proxy for changes in the user cost of capital also produces a negative and statistically significant relationship. These results are shown in the lower panel of Figure A.10.

C Model

C.1 Household Optimization

In this section of the Appendix, we present the first-order conditions characterizing the optimization problem of the household. In any period \( t \), the first-order conditions are:

\[
\{n_t\} : \frac{N'(n_t)}{U'(c_t)} = (1 - \tau^n_t)w_t, \quad (A.1)
\]

\[
\{b_{t+1}^g\}, \{b_{t+1}^c(z)\} : 1 = \beta \left\{ (1 + (1 - \tau^{k}_{t+1})r_{t+1}) \frac{U'(c_{t+1})}{U'(c_t)} \right\}, \forall z \quad (A.2)
\]

\[
\{\theta_{t+1}(z)\} : p_t = \beta \left\{ (1 - \tau^d_{t+1})d_{t+1} + (1 - \tau^g_{t+1}) (p_{t+1} - \epsilon_{t+1}) + \tau^g_{t+1} p_t \right\} \frac{U'(c_{t+1})}{U'(c_t)} \}, \forall z \quad (A.3)
\]
\{k^h_{t+1}\} : \frac{H'(k^h_{t+1})}{U'(c_t)} = \left(\frac{1}{\beta}\right) \left(\xi^h_t (1 + \Psi^h_{1,t}) - \xi^h_{t+1} \frac{1 - \left(1 - \tau^k_{t+1}\right) \delta^h - \Psi^h_{2,t+1}}{1 + \left(1 - \tau^k_{t+1}\right) r_{t+1}}\right), \quad (A.4)

where \(\Psi^h_{i,t}\) denotes the partial derivative of the adjustment cost function with respect to its \(i\)th argument in period \(t\).

**C.2 Corporate Value Function \(V_t\) and Price-to-Dividend Ratio**

In this section of the Appendix, we show how to derive the objective function of the corporation in equation (17) of the main text. First, we use the first-order conditions (A.2) and (A.3) to obtain an expression for the return to holding equity. Define the after-tax gross return to saving in bonds and to saving in the equity of any type of corporation \(z\) during period \(t\) as:

\[
R^b_t = 1 + (1 - \tau^k_{t+1}) r_{t+1},
\]

\[
R^e_t = (1 - \tau^d_{t+1}) \frac{d_{t+1}}{p_t} + (1 - \tau^g_{t+1}) \frac{p_{t+1} - e_{t+1}}{p_t} + \tau^g_{t+1}.
\]

Equalizing the returns \(R^b_t\) and \(R^e_t\) we obtain:

\[
p_t = \left(\frac{1 - \tau^d_{t+1}}{1 - \tau^g_{t+1}} \frac{1}{\Gamma_{t+1}}\right) d_{t+1} - \left(\frac{1}{\Gamma_{t+1}}\right) e_{t+1} + \left(\frac{1}{\Gamma_{t+1}}\right) p_{t+1}, \quad (A.7)
\]

\[
\Gamma_{t+1} = 1 + \left(\frac{1 - \tau^k_{t+1}}{1 - \tau^g_{t+1}}\right) r_{t+1}. \quad (A.8)
\]

Defining \(\Phi_t = \prod_{s=1}^t \Gamma_s\) and assuming \(\lim_{T \to \infty} p_{t+1+T} \left/ \left(\prod_{s=0}^T \Gamma_{t+1+s}\right)\right. = 0\), we solve forward equation (A.7) to obtain an expression for the ex-dividend value of the firm:

\[
p_t = \sum_{s=0}^\infty \left(\frac{1}{\Phi_{t+1+s}}\right) \left(\frac{1 - \tau^d_{t+1+s}}{1 - \tau^g_{t+1+s}}\right) d_{t+1+s} - e_{t+1+s}. \quad (A.9)
\]

Equation (A.9) states that the period-\(t\) ex-dividend value of corporate equity equals the present discounted value of after-tax dividends, less the present value of new share issues which current shareholders would be required to purchase in order to maintain their claim on a constant fraction of corporate distributions.

The corporation maximizes the wealth of the shareholders from holding corporate equity which equals the value of outstanding equity as of the beginning of period \(t\) including any concurrent after-tax distribution of dividends to the shareholders and tax liabilities of the shareholders. Let
this cum-dividend after-tax value be called $W_t$. Then:

$$W_t = p_t + e_t + (1 - \tau^d_t) d_t - \tau^g_t (p_t + e_t - p_{t-1}), \quad (A.10)$$

and rearranging yields:

$$W_t = (1 - \tau^g_t) p_t - (1 - \tau^g_t) e_t + (1 - \tau^d_t) d_t + \tau^g_t p_{t-1} = (1 - \tau^g_t) V_t + \tau^g_t p_{t-1}. \quad (A.11)$$

where we have defined:

$$V_t = \left(1 - \frac{\tau^d_t}{1 - \tau^g_t}\right) d_t - e_t + p_t. \quad (A.12)$$

Since the capital gains tax $\tau^g_t$ is exogenous to the corporation and $p_{t-1}$ is predetermined, maximizing $W_t$ is equivalent to maximizing $V_t$. Henceforth, we call $V_t$ the “value of the corporation.” To derive a recursive representation for the value $V_t$, we use equations (A.7) and (A.12) to obtain:

$$V_{t+1} = \Gamma_{t+1} p_t. \quad (A.13)$$

Finally substituting $p_t = V_{t+1}/\Gamma_{t+1}$ into equation (A.12), we express the value of the firm $V_t$ recursively as:

$$V_t = \left(1 - \frac{\tau^d_t}{1 - \tau^g_t}\right) d_t - e_t + \left(\frac{1}{\Gamma_{t+1}}\right) V_{t+1}. \quad (A.14)$$

We note that the price-to-dividend ratio (the inverse of the “dividend yield”) in the steady state of our model for any corporation with type $z$ is:

$$\frac{p}{d} = \frac{(1 - \tau^d_t) + (1 - \tau^g_t)(-e/d)}{(1 - \tau^k)r}. \quad (A.15)$$

In our initial steady state the price-to-dividend ratio is roughly 30, which is consistent with historical price-to-dividend ratios for many developed economies. In response to any shock that increases the term $-e/d$ across steady states, the price-to-dividend ratio increases across steady states. In our main experiment, the decrease in the price of investment goods (taken from the PWT data) increases $-e/d$ across steady states.

### C.3 Solution to the Corporation’s Problem

This section of the Appendix presents the first-order conditions characterizing the solution to the corporation’s problem and details the optimal corporate investment and financial policy.

Remember that $\beta_t^c q_t$, $\beta_t^c \mu_t^d$, $\beta_t^c \mu_t^b$ and $\beta_t^c \mu_t^e$ are the period-$t$ multipliers on the capital accumulation constraint, the dividend constraint, the debt constraint, and the equity repurchase constraint.
respectively. The functional form for equity raised implies that there is a non-trivial region where the corporation remains inactive in the equity market \( e_t = 0 \). When solving numerically for the general equilibrium of the model, we will use a differentiable approximation of the \( E(e_t) \) function (see Appendix C.6 for the details). Therefore, we assume differentiability and, using \( \beta^E_t / \beta^c_t = 1 / \Gamma_{t+1} \), we write the first-order conditions for the corporation as:

\[
\begin{align*}
\{ n_t \} : & \quad \alpha_n^{\sigma-1} \kappa A_t \left( \alpha_k^{\sigma-1} (k_t^c)^{\sigma-1} + \alpha_n^{\sigma-1} n_t^{\sigma-1} \right) \frac{\sigma-\sigma-1}{\sigma-1} n_t^{-\frac{1}{\sigma}} = w_t, \quad (A.16) \\
\{ e_t \} : & \quad \left( \frac{1 - \tau^d_t}{1 - \tau^g_t} + \mu^d_t \right) E'(e_t) = 1 - \mu^e_t \Rightarrow \frac{1 - \tau^d_t}{1 - \tau^g_t} + \mu^d_t + \frac{\mu^e_t}{E'(e_t)} = \frac{1}{E'(e_t)}, \quad (A.17) \\
\{ b_{t+1}^e \} : & \quad \frac{1 - \tau^d_t}{1 - \tau^g_t} + \mu^d_t - \mu^e_t (1 + r_{t+1}) = \frac{1}{\Gamma_{t+1}} \left( \frac{1 - \tau^d_{t+1}}{1 - \tau^g_{t+1}} + \mu^d_{t+1} \right) \left( 1 + (1 - \tau^c_{t+1}) r_{t+1} \right), \quad (A.18) \\
\{ k_{t+1}^e \} : & \quad \left( \frac{1 - \tau^d_{t+1}}{1 - \tau^g_{t+1}} + \mu^d_{t+1} \right) \left( (1 - \tau^c_{t+1}) Q_{k,t+1}(\cdot) + \tau^c_{t+1} \delta^c \right) + (1 - \delta^c - \Psi^c_{2,t+1}) q_{t+1} = \\
& \quad \Gamma_{t+1} q_t \left( 1 + \Psi^c_{1,t} - \eta \mu^b_t \right) + \mu^d_{t+1} d_1 - \mu^c_{t+1} e^1, \quad (A.19) \\
\{ x_t^c \} : & \quad q_t = \xi_t \left( \frac{1 - \tau^d_t}{1 - \tau^g_t} + \mu^d_t \right), \quad (A.20) \\
\{ d_t \} : & \quad d_t = (1 - \tau^c_t) y_t + \tau^c_t (\delta^c k_{t+1}^c + r_t b_{t+1}^c) + b_{t+1}^c + E(e_t) - x_t^c - (1 + r_t) b_{t+1}^c \geq 0, \quad (A.21) \\
\{ q_t \} : & \quad k_{t+1}^c = (1 - \delta^c) k_t^c + \frac{x^c_t}{\xi_t} - \Psi^c(k_{t+1}^c, k_t^c), \quad (A.22) \\
\{ \mu^d_t \} : & \quad \mu^d_t (d_t) = 0, \quad (A.23) \\
\{ \mu^c_t \} : & \quad \mu^c_t \left( e_t + e^0 + e^1 k_t^c \right) = 0, \quad (A.24) \\
\{ \mu^b_t \} : & \quad \mu^b_t \left( \eta_{t+1} k_{t+1}^c - (1 + r_{t+1}) b_{t+1}^c \right) = 0. \quad (A.25)
\end{align*}
\]

Figure 10 shows the decision rules for next period’s capital \( k_{t+1}^c \), equity \( e_t \), and dividends \( d_t \) as a function of the predetermined level of the capital stock \( k_t^c \) for a corporation \( z \) that takes as given the wage and the real interest rate. As in the main text, to build intuition for the investment and financial decisions of corporations in our model, we initially assume that there are no adjustment costs, no corporate bonds, no taxes on corporate profits, capital gains, and interest rates, that the price of investment goods always equals one, and that the equity repurchase constraint is simply \( e_t \geq -e^0 \). In the main text we showed that combining equations (A.19) and (A.20) yields the condition that determines the optimal corporate capital stock:

\[
Q_{k,t+1} = (1 + r_{t+1}) \left( \frac{1 - \tau^d_t + \mu^d_t}{1 - \tau^d_t + \mu^d_{t+1}} \right) - (1 - \delta^c). \quad (A.26)
\]
The main text discussed why the trajectory of $k_{t+1}^c$ in Figure 10 implies that the dividend multiplier $\mu_t^d$ changes as we vary the initial capital stock $k_t^c$ and suggests a pecking order of financing sources. To better understand the financial decisions of the firm, we now consider the first-order condition with respect to equity, equation (A.17). The left-hand side of this equation expresses the marginal benefit of raising equity. The term $\frac{(1 - \tau_d^t)}{(1 - \tau_g^t)}$ is associated with the fact that new equity issuance can increase dividend distributions, taking into account the relative importance of dividend and capital gains taxes. The term $\mu_t^d$ is the marginal benefit of relaxing the dividend constraint and $\mu_t^e$ is the marginal benefit of relaxing the equity repurchase constraint. Equity issuance is costly for the shareholders as it dilutes equity values. The marginal cost of raising one unit of equity (the right-hand side of the first-order condition) depends on the equity issuance regime. When $e_t > 0$, the marginal cost of issuing equity exceeds one because of the flotation costs associated with raising equity.

In general, a well defined solution for dividend and equity policy requires $\tau_t^d > \tau_t^g$. To see why, consider first the case without flotation costs ($E'(e_t) = 1$). If $\tau_t^d \leq \tau_t^g$, then the coefficient on dividends in the objective function of the firm, equation (17), weakly exceeds unity, whereas the coefficient on equity is equal to negative one. This implies that the corporation can always increase dividends by some amount and offset that with an increase in equity by the same amount such that the objective function weakly increases and the flow of funds constraint remains unchanged. Firms would simply raise infinite equity simply to pay it back out as dividends that same period. If $\tau_t^d = \tau_t^g$, dividends and equity are indeterminate. This case corresponds to the dividend policy irrelevance theorem of Miller and Modigliani (1961).

By contrast, when $\tau_t^d > \tau_t^g$, the coefficient on equity remains equal to minus one, but now the coefficient on $d_t$ in the objective function is less than one. This implies that the corporation will prefer to reduce dividends in order to reduce increase buybacks. This process can continue until at least one of the two constraints $d_t \geq 0$ or $e_t \geq -(e^0 + e^1k_t^c)$ binds, producing a well-defined solution where at least one of the two multipliers $\mu_t^d$ or $\mu_t^e$ is positive. In other words, the firm will never simultaneously issue new equity (or more precisely, will never repurchase anything less than $e^0 + e^1k_t^c$) and distribute more dividends than the minimum amount allowed. Because dividends have a tax disadvantage, the firm will distribute positive dividends only when the share repurchase constraint has been reached. When there are flotation costs, this intuition remains intact with the only difference that dividend taxes can then be a limited amount lower than capital gains taxes.

Now, consider introducing corporate debt. The choice of debt versus equity as a source of financing depends on how strong the tax shield on corporate debt is. To see this, combine equation
(A.18) with equation (A.20) to obtain:

$$\frac{q_t}{\xi^c_t} = \mu^b_t (1 + r_{t+1}) + \frac{q_{t+1}}{\xi^c_{t+1}} \frac{1 + (1 - \tau^c_{t+1}) r_{t+1}}{\Gamma_{t+1}}. \quad (A.27)$$

The left-hand side represents the marginal benefit of raising debt. One unit of debt increases the value of the firm by $q_t/\xi^c_t$ units which equals the marginal benefit of dividend distribution to the shareholders, $(1 - \tau^d_t) / (1 - \tau^g_t)$, plus any potential benefits from relaxing the dividend constraint, $\mu^d_t$. The right-hand side represents the marginal cost of raising a unit of debt today. First, the debt constraint may tighten ($\mu^b_t > 0$). Second, the firm foregoes the opportunity to invest $1 + (1 - \tau^c_{t+1})r_{t+1}$ units tomorrow. These units are valued at $q_{t+1}/\xi^c_{t+1}$ and discounted at $1/\Gamma_{t+1}$. Note that $\tau^c_{t+1} r_{t+1}$ are deducted from firm’s tax liabilities, so the tax shield increases the attractiveness of raising corporate debt.

Equation (A.27) can be used to illustrate the classic Miller (1977) result that debt finance is preferred to equity finance because of its tax advantage. To show this result, substitute $\Gamma_{t+1}$ from equation (A.8) into equation (A.27):

$$1 = \mu^b_t (1 + r_{t+1}) \xi^c_t + \left( \frac{1 - \tau^d_t}{1 - \tau^g_t} + \mu^d_t \right) \frac{1 + (1 - \tau^c_{t+1}) r_{t+1}}{1 + (1 - \tau^c_{t+1}) r_{t+1}}. \quad (A.28)$$

From this expression it follows that if the firm’s financial regime does not change over time ($\mu^d_t = \mu^d_{t+1}$) and dividend and capital gains taxes are constant, then we obtain $\mu^b_t > 0$ whenever:

$$\mu^b_t > 0 \iff \tau^c_{t+1} > \frac{\tau^k_{t+1} - \tau^g_{t+1}}{1 - \tau^g_{t+1}}. \quad (A.29)$$

The intuition is simply that debt payments are deducted from corporate tax liabilities whereas returns from other investments are taxed. In our numerical solutions we always have $\tau^k_{t+1} \leq \tau^g_{t+1}$, so equation (A.29) always holds. Thus, the corporation maximizes the wealth of the shareholders by borrowing from the debt market as much as possible. Since we have not considered other potential costs associated with debt financing (e.g. raising interest rates, bankruptcy costs etc.), we limit debt issuance with an endogenous borrowing constraint as shown in equation (15).

We note, however, that this argument assumes that the firm does not change its financing regime over time (i.e. that the value of installed capital does not change over time). Hennessy and Whited (2005) argue that the traditional rule in equation (A.29) is applicable only under the assumption that the firm expects to make positive distributions to the shareholders in all future periods. Instead, if the firm anticipates raising equity in the future period, the value of installed
capital increases. Under this scenario it is possible that rule (A.29) holds but the firm does not find it profitable to issue only debt.

C.4 Equilibrium

An equilibrium for our economy is a sequence of wages \( \{w_t\} \), real interest rates \( \{r_t\} \), share prices \( \{p_t\} \), consumption \( \{c_t\} \), labor supply \( \{n_t\} \), share holdings \( \{\theta_{t+1}\} \), household investment \( \{x^h_t\} \) and capital \( \{k^h_{t+1}\} \), dividends \( \{d_t(z)\} \), equity issuance \( \{e_t(z)\} \), corporate debt \( \{b^c_{t+1}(z)\} \), corporate labor demand \( \{n_t(z)\} \), corporate investment \( \{x^c_t(z)\} \) and capital \( \{k^c_{t+1}(z)\} \), and final output \( \{Q_t(z)\} \), such that, for given initial conditions \( k^c_0(z), k^h_0(z), b^c_0(z), b^g_0 \), and for given exogenous processes for taxes \( \{\tau^p_t\}, \{\tau^h_t\}, \{\tau^c_t\}, \{\tau^g_t\} \), government spending \( \{G_t\} \), government debt \( \{b^g_{t+1}\} \), aggregate factor-neutral productivity \( \{A_t\} \), investment good prices \( \{\xi^h_t\} \) and \( \{\xi^c_t\} \), and household tastes \( \{\beta_t\}, \{\chi_t\} \) and \( \{\nu_t\} \):

1. Household choices of consumption, labor supply, corporate and government bonds, corporate shares, and household investment and capital maximize utility (6) while satisfying the household capital accumulation equation (7), the budget constraint (8), and the first-order conditions listed in Appendix C.1.

2. Corporation \( z \) maximizes its value (17) by choosing labor demand, dividends, equity, corporate bonds, corporate investment and corporate capital to satisfy the first-order conditions listed in Appendix C.3.

3. Government transfers \( T_t \) adjust to always satisfy the government budget constraint (20).

4. Share prices satisfy:

\[
p_t(z) = \left( \frac{1}{1 + \frac{1-\tau^{g}_{t+1}}{(1-\tau^{g}_{t+1})r_{t+1}}} \right) V_{t+1}(z), \forall z
\]

(A.30)

where \( V_t(z) \) is the solution to (17) for a corporation with productivity \( z \).

5. Labor, bond, and equity markets clear. The goods market also clears:

\[
\int Q_t(z)\pi(z)dz = c_t + x^h_t + \int x^c_t(z)\pi(z)dz + G_t.
\]

(A.31)

We define a steady state as an equilibrium of our model in which all variables are constant over time.
C.5 Model with Perfect Capital Markets

In this Appendix we develop in more detail the model with perfect capital market. We assume that the planner can transfer resources $R_t(z)$ without cost between the corporate and household sectors. We fix the tax rates $\tau^c_t$ and $\tau^n_t$ to be the same in the two models and we assume the planner separately chooses the supply $n^h_t$ and the demand $n^c_t$ for labor. As will become clear below, this allows us to make meaningful comparisons between the models.

Let $R_t(z)$ denote the resources that flow freely from a corporation of type $z$ to the household sector in this economy. The household sector is now subject to the constraint:

$$c_t + x_t^h + b_{t+1}^g - (1 + r_t(1 - \tau^h_t))b_t^g = \int R_t(z)\pi(z)dz + T_t + \tau^h_t\delta^h k_t^h + (1 - \tau^n_t)w_t n_t^h. \quad (A.32)$$

Each firm in the corporate sector is subject to the constraint:

$$x_t^c(z) + R_t(z) = (1 - \tau^c_t) (Q_t(k_t^c(z), n_t^c(z)) - w_t n_t^c(z)) + \tau^c_t\delta^c k_t^c(z). \quad (A.33)$$

Combining (A.32) and (A.33) leads to a single budget constraint:

$$c_t + x_t^h + \int x_t^c(z)\pi(z)dz + b_{t+1}^g - (1 + r_t(1 - \tau^h_t))b_t^g - T_t - \tau^h_t\delta^h k_t^h = \int ((1 - \tau^c_t) (Q_t(k_t^c(z), n_t^c(z)) - w_t n_t^c(z)) + \tau^c_t\delta^c k_t^c(z)) \pi(z)dz + (1 - \tau^n_t)w_t n_t^h. \quad (A.34)$$

In deriving the single budget constraint we are implicitly assuming that $R_t(z)$ can take any positive or negative number without limit. This formalizes the assumption that, in the perfect capital markets economy, the planner can costlessly shift resources across the two sectors. In equilibrium, $n_t^h = \int n_t^c(z)\pi(dz) = n_t$, and therefore we can substitute into equation (21) and write:

$$c_t + x_t^h + \int x_t^c(z)\pi(z)dz + b_{t+1}^g - (1 + r_t(1 - \tau^h_t))b_t^g - T_t - \tau^h_t\delta^h k_t^h = \int ((1 - \tau^c_t)Q_t(k_t^c(z), n_t(z)) + \tau^c_t\delta^c k_t^c(z)) \pi(z)dz + w_t n_t(\tau^c_t - \tau^n_t). \quad (A.35)$$

Note that by assuming that labor demand and labor supply are chosen separately, we generate in this economy the same labor wedge as exists in our baseline model. Since $w_t n_t(\tau^c_t - \tau^n_t)$ is rebated back by the government to the household (in the $T_t$ term), we are also holding constant across these two economies any wealth effects associated with the different tax treatment of labor income and profits.
In the economy with perfect capital markets, the planner’s problem is to maximize:

$$\max \left\{ c_t \right\} \sum_{t=0}^{\infty} \beta^t \left( U(c_t) - N \left( n_t; \chi_t \right) + H \left( k_t; \nu_t \right) \right),$$  \hfill (A.36)

subject to the constraints (7), (10), and (A.34). We denote by $\beta^t q_t(z)$ the Lagrangian multiplier on each constraint (10). We substitute $x_t^h$ from (7) into (A.34) and $c_t$ from the budget constraint (A.34) into the objective function. The first-order conditions with respect to $n_t^h, n_t^c(z), b_{t+1}^h, k_{t+1}^h, k_{t+1}^c(z)$ and $x_t^c(z)$ are respectively:

$$\{n_t^h\} : \frac{N'(n_t)}{U'(c_t)} = (1 - \tau_t^u)w_t, \hfill (A.37)$$

$$\{n_t^c(z)\} : Q_{n,t}^c(k_{t+1}^c(z), n_t^c(z)) = w_t, \forall z, \hfill (A.38)$$

$$\{b_{t+1}^h\} : 1 = \beta \left\{ (1 + (1 - \tau_{t+1}^k) r_{t+1}) \frac{U'(c_{t+1})}{U'(c_t)} \right\}, \hfill (A.39)$$

$$\frac{H'(k_{t+1}^h)}{U'(c_t)} = \left( \frac{1}{\beta} \right) \left( \xi_t^h \left( 1 + \Psi_{1,t}^h \right) - \xi_{t+1}^h \frac{1 - (1 - \frac{\tau_{t+1}^k}{\xi_{t+1}^h}) \delta - \Psi_{2,t+1}^h}{1 + (1 - \tau_{t+1}^k) r_{t+1}} \right), \hfill (A.40)$$

$$\{k_{t+1}^c(z)\} : \frac{q_t}{\beta} \left( 1 + \Psi_{1,t}^c \right) = U'(c_{t+1}) \left( (1 - \tau_{t+1}^c) Q_{k,t+1}^c + \tau_{t+1}^c \delta^c + (1 - \delta - \Psi_{2,t+1}^c)q_{t+1} \right), \forall z, \hfill (A.41)$$

$$\{x_t^c(z)\} : q_t(z) = \xi_t^c U'(c_t), \forall z. \hfill (A.42)$$

### C.6 Numerical Approximations

In our numerical simulations, we solve a smoother version of the model described in the main text. The idea is that it is easier to compute the general equilibrium of the model by directly solving the set of equilibrium conditions. To do this we first approximate the flotation cost function with a smooth function. The flotation function that we consider is $E(e) = e$ when $e \leq 0$ and $E(e) = \lambda e$ when $e > 0$, for $\lambda \in [0, 1]$. This can be written as:

$$E(e) = \min\{e, \lambda e\}. \hfill (A.43)$$

An approximation of the $E(e)$ function is:

$$E(e) = -\frac{\log (\exp(-ke) + \exp(-k\lambda e))}{k}, \hfill (A.44)$$

for some large $k$. This approximation has a continuous derivative:
\[ E'(e) = \frac{\exp(-ke) + \lambda_1 \exp(-k\lambda_1 e)}{\exp(-ke) + \exp(-k\lambda_1 e)}. \] (A.45)

Second, we replace all constraints that the corporation faces by penalty functions as suggested by Haan and Ocaktan (2009). The idea of this approach is that we allow anything to be feasible, but we change the objective function such that it has undesirable consequences if the constraints are violated. For a constraint of the form \( x_t \geq b \), we consider the penalty function:

\[ P = \left( \frac{\eta_1}{\eta_0} \right) \exp(-\eta_0 (x_t - b)) - \eta_2 (x_t - b), \] (A.46)

where \( \eta_1, \eta_2, \eta_3 \geq 0 \). The original problem of the firm is:

\[ \max_{\{n_s,d_s,e_s,b_{s+1}^c,k_{s+1}^c,x_s\}} \sum_{s=t}^{\infty} \beta_s^c \left( \frac{1 - \tau_s^d}{1 - \tau_s^g} \right) d_s - e_s \geq 0, \] (A.47)

\[ x_s^c + d_s + (1 + r_s)b_s^c = (1 - \tau_s^c)y_s + \tau_s^c (\delta^c k_s^c + r_s b_s^c) + b_{s+1}^c + \min\{e_s, \lambda e_s\}, \] (A.48)

\[ k_{s+1}^c = (1 - \delta^c)k_s^c + \frac{x_s^c}{\xi_s^c} - \Psi^c (k_{s+1}^c, k_s^c); \] (A.49)

\[ d_s \geq 0, \] (A.50)

\[ (1 + r_{s+1})b_{s+1}^c \leq \eta_{s+1} k_{s+1}^c; \] (A.51)

\[ e_s \geq -(e^0 + e^1 k_s^c). \] (A.52)

By disregarding the constraints but introducing the penalty functions into the objective function and replacing the equity function with its smooth approximation, we obtain an approximation of the problem of the firm:

\[ \max_{\{n_s,d_s,e_s,b_{s+1}^c,k_{s+1}^c,x_s\}} \sum_{s=t}^{\infty} \beta_s^c \left( \frac{1 - \tau_s^d}{1 - \tau_s^g} \right) d_s - e_s - P_s^d - P_s^b - P_s^e, \] (A.53)

\[ x_s^c + d_s + (1 + r_s)b_s^c = (1 - \tau_s^c)y_s + \tau_s^c (\delta^c k_s^c + r_s b_s^c) + b_{s+1}^c + E(e_s), \] (A.54)

\[ k_{s+1}^c = (1 - \delta^c)k_s^c + \frac{x_s^c}{\xi_s^c} - \Psi^c (k_{s+1}^c, k_s^c); \] (A.55)

\[ P_s^d = \left( \frac{\eta_1^d}{\eta_0^d} \right) \exp(-\eta_0^d (d_s)) - \eta_2^d (d_s), \] (A.56)

\[ P_s^b = \left( \frac{\eta_1^b}{\eta_0^b} \right) \exp(-\eta_0^b (\eta_{s+1}^1 k_{s+1}^c - (1 + r_{s+1})b_{s+1}^c)) - \eta_2^b (\eta_{s+1}^1 k_{s+1}^c - (1 + r_{s+1})b_{s+1}^c), \] (A.57)

\[ P_s^e = \left( \frac{\eta_1^e}{\eta_0^e} \right) \exp(-\eta_0^e (e_s + e^0 + e^1 k_s^c)) - \eta_2^e (e_s + e^0 + e^1 k_s^c). \] (A.58)
Substituting $d_t$ out from the flow of funds constraint, the first-order conditions for $n_t$, $e_t$, $b_{t+1}^c$, $k_{t+1}^c$, $x_t^c$ and $d_t$ are:

$$\frac{n_t^{\sigma - 1}}{\alpha n_t^{\sigma - 1}} \kappa z A_t \left( \frac{n_t^{\sigma - 1}}{\alpha n_t^{\sigma - 1}} (k_t^c)^{\sigma - 1} + \frac{n_t^{\sigma - 1}}{\alpha n_t^{\sigma - 1}} n_t^{\sigma - 1} \right) \frac{n_t^{-1}}{\sigma - 1} n_t^{-1} = w_t, \quad (A.59)$$

$$\left( \frac{1 - \tau_t^d}{1 - \tau_t^g} + M_t^d \right) \left( \frac{1 - \tau_t^d}{1 - \tau_t^g} + M_t^d \right) E'(e_t) = 1 - M_t^c, \quad (A.60)$$

$$\frac{1 - \tau_t^d}{1 - \tau_t^g} + M_t^d - M_t^b = \left( \frac{1}{\Gamma_{t+1}} \left( \frac{1 - \tau_{t+1}^d}{1 - \tau_t^g} + M_t^d \right) \left( 1 + (1 - \tau_{t+1}^c) r_{t+1} \right) \right), \quad (A.61)$$

$$\left( \frac{1 - \tau_t^d}{1 - \tau_t^g} + M_t^d \right) \left( (1 - \tau_{t+1}^c) F'(k_{t+1}^c) + \tau_{t+1}^c \delta^c \right) + (1 - \delta^c - \Psi_{2,t+1}^c) q_{t+1} = \Gamma_{t+1} q_t \left( 1 + \Psi_{1,t}^c M_t^b / (1 + r_{t+1}) \right) - e^1 M_t^e, \quad (A.62)$$

$$q_t = \xi_t^c \left( \frac{1 - \tau_t^d}{1 - \tau_t^g} + M_t^d \right), \quad (A.63)$$

$$d_t = (1 - \tau_t^c) y_t + \tau_t^c (\delta^c k_t^c + r_t b_t^c) + b_{t+1}^c + E(e_t) - x_t^c - (1 - r_t) b_t^c, \quad (A.64)$$

$$k_{t+1}^c = (1 - \delta^c) k_t^c + \frac{x_t^c}{\xi_t^c} - \Psi^c \left( k_{s+1}, k_s^c \right), \quad (A.65)$$

$$M_t^d = -\partial P_t^d / \partial d_t = \eta_1^d \exp \left( -\eta_0^d (d_t) \right) + \eta_2^d > 0, \quad (A.66)$$

$$M_t^b = \partial P_t^b / \partial b_{t+1} = (1 + r_{t+1}) \left( \eta_1^b \exp \left( -\eta_0^b (r_{t+1}) \right) \right) + \eta_2^b > 0. \quad (A.67)$$

$$M_t^e = -\partial P_t^e / \partial e_t = \eta_1^e \exp \left( -\eta_0^e (e_t + e^0 + e^1 k_t^c) \right) + \eta_2^e > 0, \quad (A.68)$$

This procedure leads essentially to the same FOCs as before with the difference that instead of the complementary slackness conditions (A.23), (A.25), and (A.24) to determine the value of the multipliers, we now have three smooth expressions for the marginal penalty functions (the “multipliers”) given by equations (A.66), (A.67), and (A.68). In our simulations we use the values $k = 2000$, $\eta_0^d = \eta_0^e = \eta_0^b = 1000$, $\eta_1^d = \eta_1^e = \eta_1^b = 0.1$ and $\eta_2^d = \eta_2^e = \eta_2^b = 0$.

### C.7 Derivations of Section 4.5

For equation (24), we assume constant returns to scale ($\kappa = 1$) and a representative firm which significantly eases the derivations. We have verified numerically that with decreasing returns to scale and heterogeneous firms, as assumed in our model, the results are quantitatively close to the results derived here. We start by dividing the marginal product of capital in the model with imperfect markets to the marginal product of capital in the model with perfect markets. By the
first-order conditions for corporate optimization, this ratio must equal the ratio of user costs $u_R$.

Manipulating this condition, we finally take:

$$
\left( \frac{k_c}{n_I} \right) \frac{1-\sigma}{\sigma} = \left( \frac{\alpha_n}{\alpha_k} \right) \frac{1-\sigma}{\sigma} \left( u_R^{-1} \right) + u_R^{-1} \left( \frac{k_c}{n_p} \right) \frac{1-\sigma}{\sigma}.
$$

(A.69)

When $\sigma > 1$ the first term in the right-hand side of equation (A.69) introduces a wedge between the capital-to-labor ratio with imperfect markets and the capital-to-labor ratio with perfect markets. This term explains why, in the initial steady state of our model, the capital stock is more distorted in the CES model than in the Cobb-Douglas model as shown in Row (xi) of Table 2.

To derive equation (24), we totally differentiate equation (A.69) with respect to $k_c/n_I$, $k_c/n_P$ and $u_R$:

$$
\frac{d (k_c/n_I)}{d (k_c/n_P)} = u_R^{-1} \left( \frac{k_c/n_P}{k_c/n_I} \right) \frac{1-\sigma}{\sigma} \left[ 1 - \frac{\sigma (d u_R/u_R)}{d (k_c/n_P) / (k_c/n_P)} \left( 1 + \left( \frac{\alpha_n}{\alpha_k} \right) \frac{1-\sigma}{\sigma} \right) \right].
$$

(A.70)

Equation (24) is taken by applying two transformations to equation (A.70). First, we replace the term in parenthesis inside the bracket by one over the labor share $1/s_{L,P}$. This follows from dividing the first-order conditions for capital and labor:

$$
\left( \frac{\alpha_n}{\alpha_k} \right) \frac{1-\sigma}{\sigma} = \frac{u_P}{(1 - \tau_c)w_P} = \frac{1 - s_{L,P}}{s_{L,P}},
$$

(A.71)

where the last equality follows from recognizing that with constant returns to scale $Q_P = k_c(n_P/(1 - \tau_c)) + n_Pw_P$, so $u_P/((1 - \tau_c)w_P) = (1 - s_{L,P})/s_{L,P}$. Second, we substitute out the term that multiplies the brackets, $u_R^{-1} ((k_c/n_P) / (k_c/n_I)) \frac{1-\sigma}{\sigma}$, using equation (A.69) and the first-order condition (A.71) applied to the model with imperfect capital markets.

### C.8 National Income Accounting in the Model

In this section of the Appendix, we map the national accounting definitions in our data to the variables in our model. To ease the exposition, we introduce new notation in CAPS that is used only in this section.

#### C.8.1 Household

We treat the household as owner of an unincorporated business that produces services consumed by itself. The gross value added (GVA) of the household equals its gross operating surplus (GOS).
We impute this value as:

$$GVA_h^t = GOS_h^t = r_t k_h^t.$$  \hspace{1cm} (A.72)

Household gross disposable income equals:

$$GDI_h^t = GOS_h^t + \int \left((1 - \tau_t^d)d_t - \tau_t^g (p_t - p_{t-1} - e_t) + r_t(1 - \tau_t^k)b_t^c \pi(z)dz + (1 - \tau_t^n)w_t n_t + r_t(1 - \tau_t^k)b_t^g + T_t + \tau_t^k \delta_h k_t^h \right).$$  \hspace{1cm} (A.73)

In accordance with national accounting practices, capital gains taxes are included in gross disposable income even though capital gains are not. Final consumption expenditure is:

$$FCE_h^t = c_t + r_t k_h^t.$$  \hspace{1cm} (A.74)

Household gross saving is the difference between gross disposable income and final consumption:

$$S_h^t = \int \left((1 - \tau_t^d)d_t - \tau_t^g (p_t - p_{t-1} - e_t) + r_t(1 - \tau_t^k)b_t^c \pi(z)dz + (1 - \tau_t^n)w_t n_t + r_t(1 - \tau_t^k)b_t^g + T_t + \tau_t^k \delta_h k_t^h - c_t.$$  \hspace{1cm} (A.75)

Using the household budget constraint, equation (8), the household net lending or borrowing position is defined as:

$$CA_h^t = e_t + \int \left(b_{t+1}^c(z) - b_t^c(z) \right) \pi(z)dz + \left(b_{t+1}^g - b_t^g \right) = S_h^t - x_h.$$  \hspace{1cm} (A.76)

### C.8.2 Corporation $z$

Corporation’s $z$ gross value added is (suppressing the argument $z$ for simplicity):

$$GVA_t^c = Q_t(n_t, k_t^c).$$  \hspace{1cm} (A.77)

We allocate a fraction $\nu$ of the flotation costs, $e_t - E(e_t)$, to the compensation of employees $\text{COMP}_t^c$ and a fraction $1 - \nu$ to what we call “other payments to capital”, $\text{OPK}_t^c$. In our numerical solutions and in the main text we set $\nu = 0$, i.e. we allocate flotation costs entirely to the other payments to capital. Under this assumption, the labor share in the Cobb-Douglas technology is always constant. We define the corporate gross operating surplus ($\text{GOS}_t^c$) as the part of the gross value added that is not paid to employees:

$$\text{GOS}_t^c = GVA_t^c - \text{COMP}_t^c = GVA_t^c - w_t n_t - \nu (e_t - E(e_t)) = y_t - \nu (e_t - E(e_t)).$$  \hspace{1cm} (A.78)
The corporate gross operating surplus \( GOS_c^t \) is divided into other payments to capital \( (OPK_c^t) \), dividends \( (d_t) \), and gross disposable income \( (GDI_t^c) \). We define other payments to capital as the sum of interests, corporate taxes, capital transfers and some fraction of the payments for raising equity:

\[
OPK_c^t = r_t b_t^c + \tau_t^c (y_t^c - \delta^c k_t^c - r_t b_t^c) + (1 - \nu) (e_t - E(e_t)) .
\] (A.79)

Since there is no final consumption expenditure for corporations, corporate gross disposable income equals corporate saving:

\[
GDI_c^t = S^c_t = GOS_c^t - OPK_c^t - d_t = y_t - v (e_t - E(e_t)) - d_t - OPK_c^t.
\] (A.80)

So, in our model the corresponding variable of \( \Pi \) (profits) in the data is:

\[
\Pi_t = GDI_c^t + d_t = y_t - v (e_t - E(e_t)) - OPK_c^t.
\] (A.81)

Using the flow of funds equation (11), the corporate net lending or borrowing position is defined as:

\[
CA_c^t = -e_t - (b_{t+1}^c - b_t^c) = S^c_t - x_t^c.
\] (A.82)

### C.8.3 Government

Government’s gross value added and gross operating surplus are zero, \( GVA_g^t = GOS_g^t = 0 \). Government’s gross disposable income equals:

\[
GDI_g^t = \int \left( \tau_t^g d_t + \tau_t^g (p_t - p_{t-1} - e_t) + \tau_t^k r_t b_t^g + \tau_t^c (y_t - \delta^c k_t^c - r_t b_t^c) + e_t - E(e_t) \right) \pi(z) dz + \tau_t^k r_t b_t^g + \tau_t^w w_t n_t - \tau_t^h k_h - r_t b_t^g - T_t (A.83)
\]

Government final consumption expenditure is defined as:

\[
FCE_g^t = G_t.
\] (A.84)

Therefore, government’s gross saving is defined as:

\[
S_g^t = GDI_g^t - G_t.
\] (A.85)

Using the government’s budget constraint (20), the government net lending or borrowing position is simply:

\[
CA_g^t = -(b_{t+1}^g - b_t^g) = S_g^t - x_t^g.
\] (A.86)
where  \( x_t^g = 0 \). To solve the model, we substitute the transfer  \( T_t \) from the government’s budget constraint to the household sector. Once we substitute out  \( T_t \) from the government budget constraint, the household budget constraint becomes:

\[
c_t = w_t n_t + \int (d_t - e_t + (1 + r_t)b_t^c - b_{t+1}^c + \tau_t^c (y_t - \delta^c k_t^c - r_t b_t^c) + e_t - E(e_t)) \pi(z) dz - x_t^h - G_t.
\]

The gross disposable income of the household becomes:

\[
GDI_t^h = GOS_t^h + \int (d_t + r_t b_t^c + \tau_t^c (y_t - \delta^c k_t^c - r_t b_t^c) + e_t - E(e_t)) \pi(z) dz + w_t n_t - G_t + b_{t+1}^g - b_t^g.
\]

C.8.4 Economy

Adding (A.75), (A.80), and (A.83), total national gross disposable income equals:

\[
GDI_t := GDI_t^h + \int GDI_t^c(z) \pi(z) dz + GDI_t^g = r_t k_t^h + w_t n_t + \int y_t \pi(z) dz.
\]

Gross domestic product equals gross disposable income:

\[
GDP_t := GVA_t^h + \int GVA_t^c(z) \pi(z) dz + GVA_t^g = r_t k_t^h + w_t n_t + \int y_t \pi(z) dz = r_t k_t^h + Q_t = GDI_t.
\]

National gross saving is:

\[
S_t = S_t^h + \int S_t^c(z) \pi(z) dz + S_t^q = w_t n_t + \int y_t \pi(z) dz - c_t - G_t.
\]

We note that  \( S_t = GDI_t - FCE_t \) where  \( FCE_t = r_t k_t^h + c_t + G_t \). Finally, since the three net lending positions sum up to zero, national saving must equal national investment:

\[
S_t := x_t^h + \int x_t^c(z) \pi(z) dz + x_t^q = x_t \implies GDI_t - FCE_t = x_t \implies GDP_t - FCE_t = x_t \implies w_t n_t + r_t k_t^h + \int y_t \pi(z) dz = c_t + r_t k_t^h + G_t + x_t.\]

D Calibration

In this section, we describe the calibration of the parameters that appear in Table 1. The main text describes the calibration of the production function and the equity repurchase constraint.
D.1 Preferences

We assume all sub-utility functions in equation (6) are isoelastic:

\[ U(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}, \quad N(n_t) = n_t^{1+\frac{1}{\phi}} \frac{1}{1+\frac{1}{\phi}}, \quad H(k_t^h) = \nu_t \left( \frac{k_t^h}{1-\rho} \right)^{1-\rho}, \]

with log preferences for consumption and household capital \((\gamma = \rho = 1)\) and a unitary Frisch elasticity of labor supply \((\phi = 1)\). We normalize the parameter \(\chi\) to 1. We calibrate the discount factor \(\beta\) such that the real interest rate in the steady state of the model equals 4.5 percent, which is the GDP-weighted average real interest rate from the World Bank’s World Development Indicators database from 1975-2007. Given our choice of \(\tau^k\), the discount factor is \(\beta = 0.9723\).

The parameter \(\nu\) is chosen such that the steady state ratio of household investment to consumption matches the average global value in our sample. To calibrate this parameter we assume equal intertemporal elasticities of substitution in consumption and household capital \((\gamma = \rho)\) and no investment adjustment costs in the steady state. In this case, the household’s investment first-order condition (A.4) in steady state yields:

\[ \nu = \left( \frac{x^h}{c} \right)^{\frac{\gamma}{\beta (\xi \delta^h)^{\gamma}}} \frac{(1 - \tau^k)r + (1 - \tau^k/\xi)\delta^h}{1 + (1 - \tau^k)r}. \]  

We compute the value of \(x^h/c\) in our data as the ratio of adjusted household gross capital formation to household final consumption expenditure net of imputed household capital rents. We adjust household and corporate gross capital formation by adding to them a fraction of the government gross capital formation such that their ratio remains unchanged. This adjustment is necessary because we do not consider government investment in our model. Finally, we impute the steady state household capital rents as the interest rate multiplied by adjusted household gross capital formation divided by depreciation and get the value \(x^h/c = 0.1101\) in our sample. This implies a value \(\nu = 0.1218\).

D.2 Investment Technology

We normalize the price of investment goods in steady state to be \(\xi^h = \xi^c = 1\) and we assume that depreciation rates are also equal across sectors and set \(\delta^h = \delta^c = 0.06\). The rate of depreciation is chosen so that in steady state the model produces national saving and investment of 23 percent of GDP which is roughly the global average in our sample between 1975 and 2007. For our
computations, we assume that both sectors $j = h, c$ face a convex adjustment cost technology:

$$
\Psi^j_t(k^j_{t+1}, k^j_t) = \frac{\psi^j}{2} \left( k^j_{t+1} - (1 + \bar{x}^j - \delta^j)k^j_t \right)^2,
$$  \hspace{1cm} (A.95)

where $\bar{x}^j - \delta^j$ is the growth rate of the capital stock at which the sector incurs no adjustment costs. We assume that both sectors are subject to no adjustment costs in the steady state, so $\bar{x}^j = \delta^j$. Following Gourio and Miao (2010), we set $\psi^j = 1.08$.

**D.3 Government**

In the computations presented in the main text, we assume that there is no government spending ($G_t = 0$) and no government debt ($b^g_t = 0$). To calibrate the tax rates, we use data from the OECD Tax Database and take the GDP-weighted average across 34 countries of the combined central and sub-central statutory corporate income tax rate (flat or top marginal) for 1981-2007 to set $\tau^c = 0.440$. To calibrate the labor income tax rate we similarly aggregate the “average tax wedge” (both for singles and for married couples) on labor income and get $\tau^n = 0.292$. We use the weighted average of the combined central and sub-central top marginal statutory personal income tax rate imposed on dividend income between 1981-2007 to set dividend taxes to $\tau^d = 0.455$. From Becker, Jacob, and Jacob (2011), we take that the weighted average dividend tax penalty $\tau^d - \tau^g$ is 8.7 percent, yielding $\tau^g = 0.368$. Finally, we set $\tau^k = \tau^g$.

**D.4 Production Technology**

In the production function (9), we normalize $A = 0.1$ and $\alpha_n = 1$. Following Gourio and Miao (2010) and the references cited therein, we set $\kappa = 0.961$. We then parameterize $\sigma$ and $\alpha_k$ as described in the main text.

**D.5 Firm Heterogeneity and Capital Market Imperfections**

In the main text we discussed how to calibrate the parameters $e^0$ and $e^1$ in the equity repurchase constraint.

We normalize the average productivity $z$ in the economy to 1. In our numerical experiments we assume that there are two type of corporations. A measure $\pi_1 = 0.20$ of firms has high productivity $z_1$ and a measure $\pi_2 = 0.80$ of firms has low productivity $z_2$. All firms turn out to be at their equity repurchasing constraint in the initial steady state, i.e. $e(z) = - (e^0 + e^1k^c(z))$. Therefore, all firms in our model have positive value in the their initial steady-state. If, following
some shock, small firms turn out to issue equity \((e > 0 \text{ and } d = 0)\), we always assume that the household holds a mutual fund with all firms in the economy. The productivity of the most productive firms \(z_1\) is chosen such that the top 20 percent of firms represent 80 percent of total employment in the economy. Luttmer (2007) estimates a linear relationship between the log rank and log size of firms using all U.S. firms with more than 5 employees that is consistent with the largest 20 percent of firms contributing 80 percent of total employment. This yields \(z_1 = 1.0895\) and \(z_2 = 0.9776\).

We follow Gomes (2001) who estimates that the marginal flotation cost is 2.8 percent, and set \(\lambda = 0.972\). We calibrate the parameter that determines the debt collateral constraint to \(\eta = 0.2548\) by targeting the steady state ratio of debt to corporate investment. The ratio of non-financial non-farm business debt outstanding to private nonresidential fixed investment in data from the Federal Reserve averaged was approximately 3.48 during 1975-2007. In our model the debt collateral constraint always binds (given the tax shield of corporate debt), so we can calibrate the parameter using the steady state formula \(\eta = \delta^c(1 + r)(b^c/x^c)\).

### E Additional Results in the Model

#### E.1 Transitional Dynamics

In this section of the Appendix, we consider the transitional dynamics of our economy. Figure A.11 shows the transitional dynamics corresponding to column 1 of Table 4. Figure A.12 shows the transitional dynamics corresponding to column 2 of Table 4. Figure A.13 shows the transitional dynamics corresponding to column 3 of Table 4. Figure A.14 shows the transitional dynamics corresponding to column 4 of Table 4. Figure A.15 shows the transitional dynamics corresponding to column 5 of Table 4. All series in the figures have been HP-filtered with an annual parameter of 6.25.

We now discuss the assumptions for the shock processes. We assume that agents are born in 1950 in steady state. In the first period, agents become fully aware of the future path of all exogenous and endogenous variables. First, we discuss the shocks we take from the data. In all figures the corporate investment price shock \(\xi^c\) is introduced directly from the data from the PWT (1950-2007) as shown in Figure 5. We assume that after 2007 the shock stays permanently at its 2007 value. In all figures, the corporate income tax shock \(\tau^c\) is taken from the OECD data. Specifically, we assume that \(\tau^c = 0.440\) from 1950 until 1981. From 1981 until 2007 we feed the process we observe in the data. Finally, we assume that after 2007 the shock stays permanently at its 2007 value. Finally, the shocks to \(\tau^d\) and \(\tau^g\) take their steady state values until 1981. After
1981 we feed to both shocks a smooth decline until 2007. In 2007 and afterwards both $\tau^d$ and $\tau^g$ have declined by 0.30 relative to their initial steady state (0.455 and 0.368 respectively). Our assumption that both shocks are declining by similar percentage points in all dates is motivated by our global data which shows small changes in the dividend tax penalty over time.

Second, we discuss the shocks that we calibrate in order to maintain constant saving over GDP ratio and constant real interest rate ($\delta^h$, $\beta$, and $\tau^k$). In all cases, we apply consistently the following rule. The terminal value of the shock is chosen such that the saving over GDP ratio and the real interest rate in the final steady state equal their respective values in the initial steady state. For the transitional dynamics, we assume that all shocks realize in 1975 and have converged to their final steady state value by year 2007. We assume an equal change in the values of these shocks over the 33 year period. For each calibrated shock, we have one free parameter, the 1975 value of the shock. We choose this value so that in-sample (1975-2007), the saving over GDP ratio and the real interest rate equal their respective values in the initial steady state.

### E.2 Other Results

In Table A.2 we repeat the quantitative experiments that led to the results of Table 4 when in the addition of the shock in the price of corporate investment $\xi^c$ we also feed a similar shock to the price of household investment $\xi^h$. Specifically, we assume that both $\xi^c$ and $\xi^h$ decline from 1 in the initial steady state to 0.79 in the final steady state. As we see in Table A.2 our results are very similar to the results presented in Table 4 and none of our quantitative conclusions in the main text rest on the fact that we shocked only the price of corporate investment.
<table>
<thead>
<tr>
<th>Country</th>
<th>Start</th>
<th>End</th>
<th>Country</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>(15) Austria</td>
<td>1975</td>
<td>2007</td>
<td>(45) Iceland</td>
<td>1997</td>
<td>2005</td>
</tr>
<tr>
<td>(21) Taiwan</td>
<td>1983</td>
<td>2004</td>
<td>(51) Burkina Faso</td>
<td>1999</td>
<td>2001</td>
</tr>
<tr>
<td>(22) Spain</td>
<td>1985</td>
<td>2007</td>
<td>(52) Trinidad and Tobago</td>
<td>1999</td>
<td>1999</td>
</tr>
<tr>
<td>(30) Ukraine</td>
<td>1993</td>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A.1: Countries in KN Dataset with Complete Sector Saving Information

Notes: The table lists all countries in our dataset which contain complete data on the sector composition of saving along with the earliest and latest years with those data available. As discussed in Section 2.1, we only include the period from 1975 to 2007. The paper includes information on the labor shares of Cyprus, Indonesia, Israel, Luxembourg, Macedonia, Malta, Micronesia, Saudi Arabia, Senegal, Singapore, and United Arab Emirates, even though we do not have sectoral saving information for these countries. Many analyses include only countries with more than 15 years of data, a criterion which excludes some of those listed above. Australian national accounting data is recorded by fiscal year but we treat it as if recorded by calendar year.
<table>
<thead>
<tr>
<th>Production Function:</th>
<th>CD</th>
<th>CD</th>
<th>CES</th>
<th>CES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Market Imperfections:</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>(i) Δ Corporate Labor Share</td>
<td>0.000</td>
<td>0.000</td>
<td>-0.058</td>
<td>-0.053</td>
</tr>
<tr>
<td>(ii) Δ Corporate / Total Saving</td>
<td>—</td>
<td>0.049</td>
<td>—</td>
<td>0.096</td>
</tr>
<tr>
<td>(iii) Δ Corporate Saving / GDP</td>
<td>—</td>
<td>0.026</td>
<td>—</td>
<td>0.059</td>
</tr>
<tr>
<td>(iv) Δ Corporate / Total Investment</td>
<td>0.014</td>
<td>0.011</td>
<td>0.050</td>
<td>0.049</td>
</tr>
<tr>
<td>(v) Δ Corporate Investment / GDP</td>
<td>0.019</td>
<td>0.014</td>
<td>0.054</td>
<td>0.040</td>
</tr>
<tr>
<td>(vi) Δ Corporate / Total Capital</td>
<td>0.014</td>
<td>0.011</td>
<td>0.050</td>
<td>0.049</td>
</tr>
<tr>
<td>(vii) Δ Total Saving / GDP</td>
<td>0.022</td>
<td>0.018</td>
<td>0.053</td>
<td>0.041</td>
</tr>
<tr>
<td>(viii) Δ log GDP</td>
<td>0.227</td>
<td>0.220</td>
<td>0.341</td>
<td>0.297</td>
</tr>
<tr>
<td>(ix) Δ log Consumption</td>
<td>0.169</td>
<td>0.167</td>
<td>0.237</td>
<td>0.214</td>
</tr>
<tr>
<td>(x) Δ log Labor</td>
<td>0.020</td>
<td>0.016</td>
<td>-0.007</td>
<td>-0.012</td>
</tr>
<tr>
<td>(xi) Δ log Corporate Capital Stock</td>
<td>0.565</td>
<td>0.547</td>
<td>0.827</td>
<td>0.768</td>
</tr>
<tr>
<td>(xii) Δ log Wage</td>
<td>0.189</td>
<td>0.184</td>
<td>0.230</td>
<td>0.202</td>
</tr>
<tr>
<td>(xiii) Δ log User Cost</td>
<td>-0.357</td>
<td>-0.347</td>
<td>-0.357</td>
<td>-0.347</td>
</tr>
<tr>
<td>(xiv) Welfare Equivalent Consumption</td>
<td>0.243</td>
<td>0.244</td>
<td>0.363</td>
<td>0.332</td>
</tr>
</tbody>
</table>

Table A.2: Response to a Negative Investment Price Shock (Robustness to $\xi^h$)

Notes: The table examines the robustness of the results in Table 4 when in the addition of the $\xi^c$ shock we also feed a similar shock to household investment ($\xi^h = \xi^c$).
Figure A.1: Share of Observations in KN Dataset Not Downloadable from OECD or UN

Notes: The figure shows the share of observations in our dataset that come from sources other than the UN and OECD digital databases.
Figure A.2: Robustness of Key Results Using “Smooth Pasting”

Notes: These plots replicate key baseline results but using an alternative method for building the dataset which requires “smooth pasting.”
Figure A.3: Robustness of Key Results Using only 1 Source Per Country

Notes: These plots replicate key baseline results but using an alternative method for building the dataset which only uses 1 source per country.
(a) Global Corporate Labor Share and Corporate Saving Share

(b) Country Trends in Corporate Labor Share

(c) Country Trends in Corporate Saving / Total Saving

Figure A.4: Robustness of Key Results when Excluding Financial Corporations

Notes: These plots replicate key baseline results but using an alternative method for building the dataset which excludes financial sector corporations.
Figure A.5: Corporate Labor Share and Corporate Saving Trends: Robustness

Notes: These plots show the path of time fixed effects in regressions of each of our trends that also include country fixed effect. Each figure uses a different weighting scheme.
Figure A.6: Country-by-Country Relationship between Corporate Saving and Labor Shares

Notes: The figure shows trends in corporate saving shares against trends in corporate labor shares for all countries with data available for more than 15 years. Trend coefficients are reported in units per 10 years (i.e. a value of -0.05 for the corporate labor share means a 5 percentage point decline every 10 years). The largest and smallest values in each dimension of each plot are winsorized to equal the second largest and smallest values.
Figure A.7: Global Sectoral Saving Relative to GDP, 1975-2007

Notes: The figure shows global saving by sector relative to GDP. We use market exchange rates to aggregate data from all available countries at the global level.
Figure A.8: Labor Shares by Industry

Notes: The figure shows the labor share in four industries using data from the OECD.
Figure A.9: Estimated Trends in Corporate Labor Share and the User Cost of Capital

Notes: The figures show estimated trends in corporate labor shares against estimated trends in the log of the EIU measure of relative investment prices and the estimated trend in the OECD measure of capital taxes. Includes all countries in dataset with at least 15 years of data along both dimensions. The largest and smallest value in each dimension of each plot is winsorized to equal the value of the second largest or smallest value. Trend coefficients are reported in units per 10 years (i.e. a value of -0.05 for the corporate labor share means a 5 percentage point decline every 10 years).
Figure A.10: Estimated Trends in Corporate Saving Share and the User Cost of Capital

Notes: The figures show estimated trends in corporate labor shares against estimated trends in the log of the EIU measure of relative investment prices and the estimated trend in the OECD measure of capital taxes. Includes all countries in dataset with at least 15 years of data along both dimensions. The largest and smallest value in each dimension of each plot is winsorized to equal the value of the second largest or smallest value. Trend coefficients are reported in units per 10 years (i.e. a value of -0.05 for the corporate labor share means a 5 percentage point decline every 10 years).
Figure A.11: Transition Paths

Notes: The figure shows the transition path for column 1 of Table 4 as explained in Appendix E.1.
Figure A.12: Transition Paths

Notes: The figure shows the transition path for column 2 of Table 4 as explained in Appendix E.1.
Figure A.13: Transition Paths

Notes: The figure shows the transition path for column 3 of Table 4 as explained in Appendix E.1.
Figure A.14: Transition Paths

Notes: The figure shows the transition path for column 4 of Table 4 as explained in Appendix E.1.
Figure A.15: Transition Paths

Notes: The figure shows the transition path for column 5 of Table 4 as explained in Appendix E.1.
References


