Internet Appendices

(Not intended for publication)

Appendices

Appendix A describes the data used in this article and their sources. Appendix B and C describe the details of the light-industry led economy and the investment-driven economy and establish the analytical proporties regarding their transition paths under the gradualist case, respectively. Appendx D describes the laissez-faire case for both the the light-industry led economy and the investment-driven economy and establishes the analytical properties. Appendix E extends our theoretical framework to examine the impacts of two policy reforms: SOE privatization and WTO accession. Appendix F provides proofs for all propositions and lemmas.

In the appendices below, all labels for equations, tables, definitions, and propositions begin with S, standing for *supplement* to the main text.

Appendix A. Data Description and Sources

For this paper, our methodology for collecting and constructing time series is based on Higgins and Zha (2015) and Chang, Chen, Waggoner, and Zha (2016). The primary data sources are China's National Bureau of Statistics, the People's Bank of China, and CEIC. Our construction method aims for achieving consistency across different data sources for each series.

GDP: Nominal GDP by expenditure (RMB billion). Used when the components of GDP are studied, but there is a long delay of publication of this series.

GDPva: Nominal GDP by value added (RMB billion). More timely reported than GDP by expenditure.

Consumption (Household): Household consumption by expenditure (RMB billion).

GFCF: Nominal gross fixed capital formation (private + public) with no inventories (RMB billion). Nominal Gross Fixed Capital Formation [Private+Public]: Billions of RMB. Subcomponent of NominalGDP (RMB billion). CEIC ticker "CALCA – CN: GDP: by Expenditure: GCF: Gross Fixed Capital Formation."

Fixed Assets (Light Sector): Gross fixed assets in light industries. CEIC Ticker CBAWIA "CN: Ind Enterprise: Light Industry: Fixed Assets: at Cost" (gross fixed assets). The series is discontinued after 2017.

Fixed Assets (Heavy Sector): Gross fixed assets in heavy industries. CEIC Ticker CBAWID "CN: Ind Enterprise: Heavy Industry: Fixed Assets: at Cost" (gross fixed assets). The series is discontinued after 2017.

Gross Output (Light Sector): Gross Industrial Output: Light Industry. CEIC ticker CBEPAAA. Converted to RMB billion. This series was discontinued in 2012. In the 2012 NBS annual statistical yearbook, both light and heavy gross industrial output are available: http://www.stats.gov.cn/tjsj/ndsj/2012/html/N1401e.

htm. But the 2013 yearbook does not include GIO: http://www.stats.gov.cn/tjsj/ndsj/2013/html/Z1401E.htm.

Gross Output (Heavy Sector): Gross Industrial Output: Heavy Industry. CEIC ticker CBEPAAB. Converted to RMB billion. In the 2012 NBS annual statistical yearbook, both light and heavy gross industrial output are available: http://www.stats.gov.cn/tjsj/ndsj/2012/html/N1401e.htm. But the 2013 yearbook does not include GIO: http://www.stats.gov.cn/tjsj/ndsj/2013/html/Z1401E.htm.

Bank Loans Outstanding (Total): Total outstanding stock of loans from the banking sector to all enterprises. Billions of RMB. CEIC ticker CKSAC: Monthly series using December observation of each year. Original CEIC label is "CN: Loan." The series is extrapolated from 1997 back to 1978 using last monthly observation and the ratio extrapolation with the monthly series (CEIC ticker CKSAC) and a small correction to adjust for the discrepancy in the last observation of the 12-month growth rate of CKSAC and the last observation of CKSAD.

Bank Loans Outstanding (Medium & Long Term): Medium and long term outstanding stock of loans from the banking sector to all enterprises.[33] CEIC ticker CKAHLB: Monthly series using December observation of each year. Billions of RMB. Original CEIC label is "CN: Loan: Medium & Long Term." The series is extrapolated from 1999 to 1994 using last monthly observation and the ratio extrapolation (the ratio of CEIC ticker "CKAHLB – CN: Loan: Medium & Long Term" to CEIC ticker "CKSAC – CN: Loan").

Aggregate Financing: Total social financing. December value of CKABAVE: CN: Aggregate Financing. Billions of RMB. Also identical to the fourth quarter values of the original (not seasonally adjusted) quarterly series.

FAI Loans: Domestic loans used to fund fixed assets investment. Pat Higgin's recommended series for FAI funded by domestic loans. 2016 value is CEIC ticker "COMCB: CN: Fixed Asset Investment: Source of Funds: Domestic Loan." Other values for 1995-2019 are populated using the year-over-year growth rate in the 2021 China Statistical Yearbook available in table 10-2 available at http://www.stats.gov.cn/tjsj/ndsj/2021/html/E10-02.jpg. Values prior to 1995 are populated using the year-over-year growth rate of COMCB. Converted to RMB billon. The year-over-year growth rate published in the 2021 China Statistical Yearbook (CSY) is consistent with COMCB in most years except for rounding, and small differences in 2017 and 1996 and a large difference in 2010 where the published CSY

[33] Data on outstanding bank lending to non-financial enterprises for the breakdown of MLT versus ST loans is unavailable. We use the time series of total outstanding bank loans instead. Although the most recent published MLT and ST series only extend back to 1999, previously published series are available back to 1994 (see the bottom chart of Figure 22 in Chang, Chen, Waggoner, and Zha (2016), who show that the ratio of MLT and ST outstanding loans was low and stable from 1994 to 1998).

2010 growth rate is 8.2 percentage points larger than the growth rate calculated from COMCB. There is more likely to be a break in 2010 in COMCB than there is in the 2021 CSY table 10-2.

GDP (Japan): Japan:Nominal GDP, expenditure basis: Billions of Yen. Starting in 1994, derived from CEIC ticker JAYAIDAAAAAWKU. Extrapolated back to 1980 using CEIC ticker JAPBMK and ratio extrapolation. Then extrapolated back to 1955 using the sum of the 4 quarterly values of CEIC ticker JABB which is a discontinued quarterly NSA GDP series from 1955 to 2001.

GDP (Singapore): Singapore: Nominal GDP, expenditure basis: Billions of Singapore dollars. Derived from CEIC ticker SAZGAAAAAAAAOR.

GDP (Korea): South Korea: Nominal GDP, expenditure basis: Billions of Won. Derived from CEIC ticker KAZAJKBAAAAASM.

GDP (Taiwan): Taiwan: Nominal GDP, expenditure basis: Billions of Taiwan dollars. Derived from CEIC ticker WAAABA.

Current Account Balance: Current account balance: Billions of RMB. Starting in 2010, annual sum of quarterly CEIC variable CJBFMA. From 1998 to 2009, quarterly CEIC ticker CJATAG, which is in USD, is multiplied by the quarterly average of the RMB/USD exchange rate taken from Haver Analytics FXCHIUSECON and then summed across the 4 quarters of the year. Prior to 1998, annual CEIC ticker CJATEK, which is in USD, , is multiplied by the annual average of the RMB/USD exchange rate taken from Haver Analytics FXCHIUSECON.

Current Account Balance (Japan): Japan: Current account balance: Billions of Yen. CEIC series number 459138957 that is originally from OECD.

Current Account Balance (Singapore): Singapore: Current account balance: Billions of Singapore dollars. Derived from CEIC ticker WAABBA.

Current Account Balance (Singapore, 1983): Singapore: Current account balance: Billions of Singapore dollars. Discontinued after 1983. Constructed using electronic pdf copy of 1984 International Monetary Fund publication Supplement on Balance of Payments. The current account data in that publication is in IMF "Special Drawing Rate [SDR]" units, so converted to Singapore dollars with IMF/CEIC exchange rate.

Current Account Balance (Korea): South Korea: Current account balance: Billions of Won. Derived by multiplying the monthly current account balance in USD – CEIC ticker KJZGHMVAAAAAAB – with the Won to dollar exchange rate from Haver Analytics [FXKORUSECON].

Current Account Balance (Korea, 1983): South Korea: Current account balance: Billions of Won. Discontinued after 1983. Constructed using electronic pdf copy of 1984 International Monetary Fund publication Supplement on Balance of Payments. The current account data in that publication is in IMF "Special Drawing Rate [SDR]" units, so converted to Won with IMF/CEIC exchange rate.

Current Account Balance (Taiwan): Taiwan: Current account balance: Billions of Taiwan dollars. Starting in 1984q1, quarterly CEIC ticker WJZOA which is balance in USD is multiplied by exchange rate from Haver [FXTWNUSECON]. From 1981q1-1983q4, series is the product of CEIC ticker WJZA which is a discontinued USE trade balance and the same exchange rate. The spliced series then summed to annual level.

Current Account Balance (Taiwan, 1996): Taiwan: Current account balance: Billions of Taiwan dollars. Discontinued quarterly CEIC ticker WJZOA that ends in 1996q4 which is balance in USD is multiplied by exchange rate from Haver [FXTWNUSECON]. The spliced series then summed to annual level.

GFCF (Japan): Japan: Nominal Gross Fixed Capital Formation [Private+Public]: Billions of Yen. The series is extrapolated back to 1955 using ratio extrapolation.

GFCF (Singapore): Nominal Gross Fixed Capital Formation [Private+Public]: Billions of Singapore dollars. Derived from CEIC ticker SAVGL.

GFCF (Korea): Nominal Gross Fixed Capital Formation [Private+Public]: Billions of Won. Derived from CEIC ticker KAZAJKBAAAAASA.

GFCF (Taiwan): Nominal Gross Fixed Capital Formation [Private+Public]: Billions of Taiwan dollars. Derived from CEIC ticker WAAABAACA.

Appendix B. The Light-Industry Led Economy

B.1. **Technology.** The competitiveness of the final goods market implies the following first-order condition:

$$\frac{Y_t^k}{Y_t^l} = \varphi^\sigma \left(\frac{P_t^l}{P_t^k}\right)^\sigma, \tag{S1}$$

where Y_t^j, P_t^j denotes output and price of the type-j intermediate goods at period t, $j \in \{K, L\}$. Normalizing the final goods price to one and using the zero-profit condition for final goods, we have:

$$\left[\varphi^\sigma \left(P_t^k\right)^{1-\sigma} + \left(P_t^l\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}} = 1. \tag{S2}$$

B.2. **L-Firms.** As wages and costs of capital enter the IC constraint symmetrically, first order conditions for solving problem (3) give the L-firm's demand for labor as

$$L_t = \frac{(1-\alpha) R_t^K K_t^l}{\alpha w_t}, \tag{S3}$$

no matter whether constraint (2) is binding or not. Substituting out L_t in the L-firm's production function with equation (S3), we have

$$Y_t^l = K_t^l \left(\frac{(1-\alpha)\chi R_t^K}{\alpha w_t}\right)^{1-\alpha}. \tag{S4}$$

As we show later, as long as $L_t \leq \overline{L}$, L-sector faces perfectly elastic labor supply, which implies that the wage rate w_t is constant. In this case, the production function of the L-firm is linear in K_t^l according to equation (S4)—the AK feature of production.

When the IC constraint is unbinding, first-order conditions imply

$$P_t^l = \frac{R_t^l}{1-\psi}\left(\frac{R_t^K}{\alpha}\right)^{\alpha}\left(\frac{w_t}{(1-\alpha)\,\chi}\right)^{1-\alpha}. \tag{S5}$$

When the IC constraint is binding, it must be true that

$$P_t^l \geq \frac{R_t^l}{1-\psi}\left(\frac{R_t^K}{\alpha}\right)^{\alpha}\left(\frac{w_t}{(1-\alpha)\,\chi}\right)^{1-\alpha}.$$

Intuitively, when the IC constraint is binding, the supply of the labor-intensive intermediate goods is below its counterpart in the case of unbinding IC constraint, which pushes the price of labor-intensive intermediate goods above the level when the IC constraint is not binding.

Proposition S1. When $K_t^l > \frac{\alpha}{R}\frac{N_t}{(1-\theta)}$, IC constraint (2) is binding.

Proof. See Appendix F.1. □

B.3. **Managers' Problem.** First-order conditions deliver the optimal savings of the manager as

$$s_{t+1}^m = \frac{m_t}{1+\beta^{-\gamma}\left(R_{t+1}^D\right)^{1-\gamma}}. \tag{S6}$$

B.4. **Workers' Problem.** The first-order condition for labor supply, together with the constraint on labor endowment, implies the kinked labor supply curve as

$$w_t = \underline{w} \text{ for } L_t < \overline{L},$$
$$w_t \geq \underline{w} \text{ for } L_t = \overline{L}.$$

Workers' labor supply is perfectly elastic at $\underline{w}$ until it is binding at $\overline{L}$.

B.5. **K-Firms.** The optimality condition implies

$$P_t^k = \frac{R_t^L}{1-\tau}. \tag{S7}$$

Equation (S7) gives the perfectly elastic supply curve of capital-intensive goods. P_t^k and R_t^L will be endogenously determined by the capital-intensive intermediate goods and intertemporal loan market clearing conditions, respectively.

B.6. **The Bank's Problem.** The optimality condition is given by:

$$R_t^l = 1, R_t^K = R_t^L = R_t^D = R. \tag{S8}$$

In equilibrium, $D_t = s_t^w + s_t^m = B_t^P + B_t^k + K_t^l$, where B_t^P denotes the bank's investment in foreign bonds.

B.7. **The Government's Problem.** We assume that the government's net worth N_{t+1} in the next period is a fraction ξ of the current period capital stock of K-firms, i.e.,

$$N_{t+1} = \xi K_t^k, \tag{S9}$$

where $0 \leq \xi \leq 1$. The government's budget constraint can be written as follows:

$$B_{t+1}^G + N_{t+1} = \Pi_t^k + \Pi_t^l + T_t + \Pi_t^b + RB_t^G, \tag{S10}$$

where B_t^G represents government assets invested in foreign bonds at the beginning of the period with the fixed interest rate R. $T_t = \tau P_t^k K_t^k$ denotes the revenue expropriated by the government from the K-firm.

B.8. **Equilibrium Conditions.** Below we list all the equilibrium conditions:

$$\begin{aligned}
L_t &= \frac{(1-\alpha) R_t^K K_t^l}{\alpha w_t}, && \text{(S11)}\\
\Pi_t^l &= (1-\psi) P_t^l \left(K_t^l\right)^{\alpha} (\chi L_t)^{1-\alpha} - R_t^l \left(w_t L_t + R_t^K K_t^l\right) + (1-\delta) K_t^l, && \text{(S12)}\\
K_t^l &= \frac{\alpha}{R_t^K} \frac{R_t^l N_t}{R_t^l - \theta(1-\psi) P_t^l \left(\frac{(1-\alpha)\chi}{w_t}\right)^{1-\alpha} \left(\frac{\alpha}{R_t^K}\right)^{\alpha}}, && \text{(S13)}\\
R_t^l &= 1, && \text{(S14)}\\
\Pi_t^k &= (1-\tau) P_t^k K_t^k - R_t^L \left(K_t^k - N_t\right) + (1-\delta) K_t^k, && \text{(S15)}\\
\Pi_t^B &= \left(R_t^l - 1\right) B_t^l, && \text{(S16)}\\
B_t^k &= K_t^k - N_t, && \text{(S17)}\\
B_t^l &= w_t L_t + R_t^K K_t^l, && \text{(S18)}\\
N_{t+1} &= \xi K_t^k, && \text{(S19)}\\
Y_t &= \left[\varphi \left(Y_t^k\right)^{\frac{\sigma-1}{\sigma}} + \left(Y_t^l\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, && \text{(S20)}\\
Y_t^k &= K_t^k, && \text{(S21)}\\
Y_t^l &= \left(K_t^l\right)^{\alpha} (\chi L_t)^{1-\alpha}, && \text{(S22)}\\
1 &= \left[\varphi^{\sigma} \left(P_t^k\right)^{1-\sigma} + \left(P_t^l\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}}, && \text{(S23)}\\
P_t^k &= R/(1-\tau), && \text{(S24)}\\
B_{t+1}^G &= T_t + \Pi_t^k + \Pi_t^l + \Pi_t^b + RB_t^G - N_{t+1}, && \text{(S25)}\\
P_t^l &= \frac{P_t^k}{\varphi} \left(\frac{Y_t^k}{Y_t^l}\right)^{\frac{1}{\sigma}}, && \text{(S26)}\\
s_{t+1}^w &= w_t / \left(1 + \beta^{-\gamma} (R_{t+1}^D)^{1-\gamma}\right), && \text{(S27)}\\
s_{t+1}^m &= m_t / \left(1 + \beta^{-\gamma} (R_{t+1}^D)^{1-\gamma}\right), && \text{(S28)}
\end{aligned}$$

$$B_t^P = s_t^w + s_t^m - B_t^k - K_t^l, \tag{S29}$$

$$c_{1t}^w = w_t - s_{t+1}^w, \text{ and } : c_{2t}^w = s_t^w R_t^D. \tag{S30}$$

$$c_{1t}^m = m_t - s_{t+1}^m, \text{ and } : c_{2t}^m = s_t^m R_t^D. \tag{S31}$$

Note that both P_t^k and P_t^l are constant along the transition. Therefore, we can drop the time subscript and denote $P_t^k \equiv P^k$ and $P_t^l \equiv P^l$.

Combining the budget constraints of households, firms, and the government, we obtain the following resource constraint

$$C_t + I_t + S_t^{\text{CA}} = Y_t^{\text{GDP}} = Y_t + (R-1)\left(B_t^P + B_t^G\right), \tag{S32}$$

where

$$\begin{aligned} C_t &= c_{1t}^w + c_{2t}^w + c_{1t}^m + c_{2t}^m, \\ I_t &= K_{t+1} - (1-\delta) K_t, \\ K_t &= K_t^k + K_t^l, \\ S_t^{\text{CA}} &= B_{t+1}^P + B_{t+1}^G - \left(B_t^P + B_t^G\right). \end{aligned}$$

B.9. **Characterizing the Transitional Path.** In this section, we study the dynamic patterns of various macroeconomic variables along the transitional path in which $L_t \leq \overline{L}$. Accordingly, the wage rate is constant ($w_t = \underline{w}$). To obtain the closed-form solution and without loss of generality, we assume $\delta = 1$. Our purpose is to demonstrate that the predictions along the transitional path are consistent with the fact that TFP growth is the primary driver of the light-industry led economy, as reported in Table 1, as well as with the empirical data on sectoral credit and resource allocation discussed in Section III.

Credit and capital allocation between two sectors. The revenue ratio between the two sectors is

$$\frac{P_t^k Y_t^k}{P_t^l Y_t^l} = \left(\frac{P_t^k}{P_t^l}\right)^{1-\sigma} \varphi^\sigma.$$

One can see from equations (S7) and (S23) that the revenue ratio between the two sectors is constant, consistent with the top panel in Figure 7 for the period before 1998. There is no resource reallocation between the two sectors along the transitional path.

The labor income share is also constant, consistent with the pattern in Figure 6 for the period before 1998. The labor income in our model is the sum of the wage income and the $1-\alpha$ fraction of the L-firm's profit Π_t^l:

$$\frac{w_t L_t + (1-\alpha)\Pi_t^l}{Y_t} = (1-\alpha)\frac{1}{1 + P_t^k Y_t^k / \left(P_t^l Y_t^l\right)}. \tag{S33}$$

Since the revenue ratio $\frac{P_t^k Y_t^k}{P_t^l Y_t^l}$ is constant, the labor income share is constant.

The ratio of capitals (or investments) between the two sectors is also constant, consistent with the bottom panel in Figure 7 for the period before 1998. Substituting (S1) and (S3) into the production functions in both sectors, we have

$$\frac{K_t^k}{K_t^l} = \varphi^\sigma \left(\frac{\chi\left(1-\alpha\right)R}{\alpha w_t}\right)^{1-\alpha} \left(\frac{P_t^l}{P_t^k}\right)^\sigma, \tag{S34}$$

which is constant when $w_t = \underline{w}$ for $L_t \leq \overline{L}$.

The ratio of investment loan to working capital loan can be computed as follows

$$\frac{B_t^k}{B_t^l} = \frac{K_t^k - N_t}{\frac{R}{\alpha}K_t^l - N_t}, \tag{S35}$$

where we have used equation (S3).

Transitional dynamics in each of the two sectors can be characterized by the AK feature.

Proposition S2. During the transition path in which $L_t < \overline{L}$, bank loan to labor-intensive sector, capital and labor K_t^l, K_t^k and L_t, and aggregate output have the same constant growth rate:

$$\frac{B_{t+1}^l}{B_t^l} = \frac{K_{t+1}^l}{K_t^l} = \frac{K_{t+1}^k}{K_t^k} = \frac{L_{t+1}}{L_t} = \frac{Y_{t+1}}{Y_t} \equiv g_A,$$

where

$$g_A = \frac{\xi\left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha}\left(\frac{\alpha}{R}\right)^\alpha \varphi\left(\frac{P^l}{P^k}\right)^\sigma R^l}{R^l - \theta(1-\psi)P^l\left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha}\left(\frac{\alpha}{R}\right)^\alpha}. \tag{S36}$$

Proof. See Internet Appendix F.2. □

The intuition for Proposition S2 is as follows. The rate of returns to capital for L-firms is constant because of the labor surplus during the transition. The linear law of motion for the government's net worth and the constant price of goods produced by K-firms imply that the growth rate of L-firms' capital is constant. Because capital in K-firms is proportional to capital in L-firms, the growth rate of capital in K-firms must be as well. The same intuition applies to the growth rate of demand for L-firms' labor.

From Proposition S2 one can derive the aggregate investment rate and the ratio between bank loans to the two sectors. The aggregate investment rate is a weighted average of investment rates across the two sectors:

$$\frac{I_t}{Y_t} = \frac{I_t^k}{P_t^k Y_t^k}\frac{P_t^k Y_t^k}{Y_t} + \frac{I_t^l}{P_t^l Y_t^l}\frac{P_t^l Y_t^l}{Y_t}, \tag{S37}$$

where the weight equals the revenue share of each sector. Because the revenue share in each sector is constant, the aggregate investment rate is constant according to equation (S37) as long as the investment rate in each sector (i.e., $\frac{I_t^k}{P_t^k Y_t^k}$ or $\frac{I_t^l}{P_t^l Y_t^l}$)) is constant. We have the following proposition.

Proposition S3. The investment rate in each sector and the ratio between bank loans to the two sectors are constant along the transitional path.

Proof. See Internet Appendix F.3. □

The intuition for Proposition S3 is as follows. During the transition in which $L_t < \overline{L}$, it follows from equation (S4) that the production technology in the labor intensive sector is of AK. Since the production technology in the capital intensive sector is also of AK, the investment rate in each sector must be constant. This result, together with the constant revenue share of the final output in each sector, implies that the aggregate investment rate is also constant. The ratio of bank loans to both sectors is constant because the capital stock in each sector and therefore bank loans to each sector are proportionate to the government's net worth. This result is robust to a case in which the depreciate rate is less than one. In this general case, investment in each sector remains proportionate to the capital stock in its own sector:

$$I_t^j = (g_A - (1-\delta))\, K_t^j, \quad \text{for } j \in \{k,\, l\}\,.$$

Endogenous TFP growth. The growth accounting in Table 1 reveals that TFP growth is the main driver of the light-industry led economy. Our theoretical model's prediction is consistent with this empirical finding. With the Cobb-Douglas production function, our model's aggregate TFP is calculated in the same way as in our data:

$$TFP_t = \frac{Y_t}{K_t^{\eta}\overline{L}^{1-\eta}}, \tag{S38}$$

where $1-\eta$ is the aggregate labor income share as measured in the data. Thus, it must be $\eta > \alpha$ because $1-\alpha$ is the labor income share for the light (labor-intensive) sector. Note that instead of $L_t, \overline{L}$ enters the denominator of the definition of TFP. In China, there is no data on hours worked and the employment is used to compute aggregate TFP in the data. When we calculate the aggregate TFP, the employment in the data corresponds to the total labor endowment in our model rather than actual hours worked.

Proposition S4. The aggregate TFP can be expressed as

$$TFP_t = A\left(\frac{L_t}{\overline{L}}\right)^{1-\eta},$$

where A is a constant. As a result, the aggregate TFP grows at a constant rate of $g_A^{1-\eta}$.

Proof. See Internet Appendix F.4. □

Song, Storesletten, and Zilibotti (2011) have a two-sector model describing China's economy since late 1990s. Our model differs from theirs in two critical aspects. First, in SSZ, during the transition stage, labor is reallocated from the SOE sector with a higher investment

rate to the POE sector with a lower investment rate (POEs) while POEs accumulates capital to capture labor reallocation during SOE privatization. In our model, a key feature of the light-industry led economy—the labor surplus—is addressed through an increased demand for labor by firms in the light (labor-intensive) sector.

Second, the source of TFP growth is different from SSZ. Both models focus on endogenous TFP growth, but its source differs. In SSZ, the labor allocation is efficient and the aggregate TFP growth stems from reallocating capital from the SOE sector to the POE sector. In our model, by contrast, the aggregate TFP growth originates from an improvement of allocative efficiency from the idle household labor to the market production. This mechanism is consistent with the institutional fact that an emergence of township-village and collectively owned enterprises during the early period of China's opening-up reforms attracted the idle labor from households into the market production.

The intuition for the growth of endogenous TFP (Proposition S4) is straightforward. As demands for labor in L-firms rise with an increase of the government's net worth, more labor hours per worker are reallocated from home production to market production. This reallocation raises the aggregate output per worker (labor productivity) and therefore the aggregate TFP. The TFP in the labor-intensive sector is

$$TFP_t^l = \frac{Y_t^l}{\left(K_t^l\right)^{\alpha} \overline{L}^{1-\alpha}}.$$

Similar to the proof of Proposition S4, one can show that

$$\frac{TFP_{t+1}^l}{TFP_t^l} = g_A^{1-\alpha}.$$

Since $1-\alpha > 1-\eta$, we have

$$\frac{TFP_{t+1}^l}{TFP_t^l} > \frac{TFP_{t+1}}{TFP_t}.$$

Thus, the source of the aggregate TFP growth is the growth of endogenous TFP in the light (labor-intensive) sector, consistent with the empirical findings in the existing literature.[34]

Appendix C. The Investment-Driven Economy

C.1. **K-Firms.** (6) implies that if the demand for capital satisfies the condition $K_t^k \leq N_t/(1-\theta)$, then the financial constraint is not binding, with $R = P_t^k$. If, on the other hand, $K_t^k > N_t/(1-\theta)$, the financial constraint must bind. With the binding constraint, we obtain from (6) the capital demand by K-firms

$$K_t^k = \frac{R_t^L}{R_t^L - \theta P_t^k} N_t. \tag{S39}$$

[34] See the Brookings opinion article "Future Path of China's SOE Reforms" (in Chinese) available at http://brook.gs/2bPJHBB.

Accordingly, the amount borrowed by the K-firm is

$$B_t^k = \frac{\theta P_t^k}{R - \theta P_t^k} N_t. \tag{S40}$$

C.2. **L-Firms.** The gross return to the L-firm's capital is given by

$$\rho_t^l \equiv \Pi_t^l / K_t^l = (1-\psi)\,\alpha P_t^l \left(K_t^l / L_t\right)^{\alpha-1} (\chi)^{1-\alpha} + 1 - \delta. \tag{S41}$$

The first-order condition for the L-firm's problem gives

$$(1-\psi)\,(1-\alpha)\,P_t^l \left(K_t^l / L_t\right)^{\alpha} (\chi)^{1-\alpha} = R_t^l w_t. \tag{S42}$$

Since $s_t^m = K_{t+1}^l$, the law of motion for the L-firm's capital becomes

$$K_{t+1}^l = \frac{\psi}{1 + \beta^{-\gamma} \left(\rho_{t+1}^l\right)^{1-\gamma}} P_t^l \left(K_t^l\right)^{\alpha} (\chi L_t)^{1-\alpha}. \tag{S43}$$

C.3. **Entrepreneurs' Problem.** First-order conditions determine the optimal saving of young entrepreneurs:

$$s_t^m = \frac{m_t}{1 + \beta^{-\gamma} \left(\rho_{t+1}^l\right)^{1-\gamma}}. \tag{S44}$$

The difference between equations (S6) and (S44) is that $\rho_{t+1}^l > R_{t+1}^D = R$.

C.4. **The Bank's Problem.** The bank's problem is

$$\Pi_t^b = \underset{B_t^l, B_t^k, D_t}{\text{Max}}, R_t^l B_t^l + R_t^L B_t^k + R(D_t - B_t^k) - R_t^D D_t - B_t^l.$$

The first-order conditions give

$$R_t^l = 1, R_t^L = R_t^D = R. \tag{S45}$$

In equilibrium, $D_t = s_t^w$ and $B_t^l = w_t L_t$.

C.5. **The Government.** A combination of (S39) and $N_{t+1} = \xi K_t^k$, where $0 \leq \xi \leq 1$, gives the law of motion for the K-firm's net worth

$$N_{t+1} = \frac{R_t^L \xi}{R_t^L - \theta P_t^k} N_t. \tag{S46}$$

Appendix D. The Laissez-Faire Case

In this section, we lay out the problems of each agent in the laissez-faire case. We describe the environment of the laissez-faire case in the context of the light-industry led economy and the investment-driven economy, respectively. Accordingly, we compare the transitional path of laissez-faire case with that of the gradualist case in both economies.

D.1. **The Light-Industry Led Economy.** The problem of the young workers in the laissez-faire case is similar to their counterparts in the light-industry led economy. Specifically, the young workers can engage in home production, which generates $\underline{w}$ units of consumption goods for each unit of home labor. According, the for a worker borned at period t, his/her consumption saving problem is

$$\max_{c_{1t}^w, c_{2t+1}^w, L_t} \frac{\left(c_{1t}^w - \underline{w}\left(L_t - \overline{L}\right)\right)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} + \beta \frac{\left(c_{2t+1}^w\right)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}}$$

subject to

$$\begin{aligned} c_{1t}^w + s_{t+1}^w &= w_t L_t, \\ c_{2t+1}^w &= s_{t+1}^w R_{t+1}^D, \\ L_t &\leq \overline{L}, \end{aligned}$$

The young entrepreneur's problem in the laissez-faire case is similar to the young entrepreneur in the investment-driven economy. In both situations, L-firms are privatized and must depend on self-financing for capital investment. Specifically, a young entrepreneur serves as a manager for the old entrepreneur, who is the owner of the labor-intensive firm. After receiving managerial compensation, the young entrepreneur can choose between investing in the labor-intensive firm and becoming its owner in the next period. Since the rate of return to capital investment, ρ_t^l, is always greater than R in the steady state, the young entrepreneur always prefers investing in capital to depositing in the bank. Specifically, the young entrepreneur's consumption-saving problem is

$$\max_{s_t^m} \frac{\left(m_t - s_{t+1}^m\right)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} + \beta \frac{\left(\rho_{t+1}^l s_{t+1}^m\right)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}}.$$

where $m_t = \psi\left(K_t^l\right)^{\alpha}\left(\chi L_t\right)^{1-\alpha}$. $\rho_t^l \equiv \Pi_t^l / K_t^l$ is the average rate of return to capital for an old entrepreneur at time t, which solves the following problem

$$\Pi_t^l \equiv \max_{L_t} P_t^l \left(1-\psi\right)\left(K_t^l\right)^{\alpha}\left(\chi L_t\right)^{1-\alpha} - R_t^l w_t L_t + \left(1-\delta\right) K_t^l, \tag{S47}$$

The problem of a capital-intensive firm is similar to its counterpart in the light-industry led economy. Specifically, a capital-intensive firm choose its capital input to solve the following profit maximization problem

$$\Pi_t^k \equiv \max_{K_t^k} \left(1-\tau\right) P_t^k K_t^k - R_t^L\left(K_t^k - N_t\right) + \left(1-\delta\right) K_t^k,$$

where P_t^k is the price of the K-firm's output, Π_t^k is the sum of the K-firm's profit and the capital stock after the depreciation, and δ is the depreciation rate. τ represents the fraction of K-firm's revenue expropriated by the government. The first order condition gives $P_t^k = R_t^L\left(1-\tau\right)$. Therefore, with (S2), both P_t^k and P_t^l are constant.

Without loss of generality, we assume that the intertemporal elasticity of substitution $\gamma = 1$. The following proposition characterizes the dynamics of the laissez-faire case

Proposition S5. During the transition, the equilibrium dynamics of capital are given by $K_{t+1}^l / K_t^l = \widetilde{g}_{A,t}$, where

$$\widetilde{g}_{A,t} = \psi \left(P_t^l\right)^{\frac{1}{\alpha}} \left(\frac{(1-\psi)(1-\alpha)\chi}{w_t}\right)^{\frac{1-\alpha}{\alpha}} \frac{1}{1+\beta^{-\gamma}}.$$

Proof. See Internet Appendix F.5. □

Proposition S5 implies that the laissez-faire case experiences a transition stage where $L_t \leq \overline{L}$ and

$$\widetilde{g}_A = \psi \left(P_t^l\right)^{\frac{1}{\alpha}} \left(\frac{(1-\psi)(1-\alpha)\chi}{\underline{w}}\right)^{\frac{1-\alpha}{\alpha}} \frac{1}{1+\beta^{-\gamma}}. \tag{S48}$$

Intuitively, where there is surplus labor from the household sector, the wage rate will remain constant at the reservation wage. Hence, capital per effective unit of labor $K_t^l / (\chi L_t)$ will remain constant. With constant P_t^l, the labor-intensive sector exhibits AK feature. Since under log utility the saving rate is constant, the growth rate of K_t^l is constant along transition.

With Proposition S5, we establish the following lemma about the growth rate of aggregate output.

Lemma S1. *Along the transition path, a sufficient condition for the growth rate of aggregate output to be larger in the light-industry led economy than in the laissez-faire case is* $\theta \geq \underline{\theta}$, *where*

$$\underline{\theta} = 1 - \left(\frac{\alpha}{R}\right)^{\alpha} \frac{1+\beta^{-\gamma}}{\psi(1-\psi)^{\frac{1-\alpha}{\alpha}} (P^l)^{\frac{1}{\alpha}}} \xi\psi \left(\frac{P^l}{P^k}\right)^{\sigma} \left(\frac{\chi(1-\alpha)}{\underline{w}}\right)^{(1-\alpha)\left(1-\frac{1}{\alpha}\right)}. \tag{S49}$$

Proof. See Internet Appendix F.6. □

Lemma S1 suggests that with sufficiently large θ, the growth rate of K_t^l will be higher in the light-industry led economy than the laissez-faire case. Hence, the growth rate of aggregate output is also higher in the light-industry led economy.

D.2. **The Investment-Driven Economy.** To compare the dynamics of the model with that of the investment-driven economy, we switch to the case that the surplus labor from the household sector is depleted, i.e. $L_t = \overline{L}$. Accordingly, the economy enters a transition stage that features decreasing return to K_t^l. We establish the following proposition to characterize the transition path.

Proposition S6. During the transition, the investment-output ratio steadily declines, the labor income share is constant, capital is reallocated toward the labor-intensive sector.

Proof. See Internet Appendix F.7. □

The intuition for proposition S6 is as follows. The aggregate investment rate is a weighted average of the investment rate of capital-intensive and labor-intensive sector, with the revenue share as weights. Since P_t^k and P_t^l are constant, the revenue share between the two sectors are constant. With log utility, savings and investment in the labor-intensive sector is proportional to the revenue of labor-intensive firms. Thus, the investment rate in the labor-intensive sector is constant. The investment rate in the capital-intensive sector is proportional to the growth rate of capital in this sector, which, in turn, increases in the growth rate of capital in the labor-intensive sector. Due to decreasing marginal return to capital in the labor-intensive sector, the growth rate of capital in the labor-intensive sector decreases over time. Hence, the investment rate in the capital-intensive sector, and thus the aggregate investment rate, decrease over time. The labor income share is constant as the revenue share between the two sectors is constant. Since the labor input is constant, to maintain a constant revenue share between the two sector, the growth rate of capital in the labor-intensive sector is higher than that in the capital intensive sector.

Proposition S6 also implies an increase in aggregate TFP during the transition. The intuition is simple, the revenue marginal product of capital is higher in the labor intensive sector than in the capital-intensive sector. Hence, as capital is reallocated from capital-intensive sector to labor-intensive sector, aggregate TFP increases.

Appendix E. Model Extension

The framework in the main text, centered on ownership structure and credit policy, abstracts from numerous policy changes that could be significant for China's macroeconomic development over the past four decades. In this appnedix, we expand our framework to examine the impacts of additional policy reforms that China has implemented over the past four decades.

E.1. **SOE Privatization.** Our framework focuses on capital deepening as a source of aggregate output growth and abstracts from an endogenous TFP increase as an alternative source, as shown by Table 1. To incorporate endogenous TFP, one can introduce the mechanism of Song, Storesletten, and Zilibotti (2011) into the investment-driven economy by including both SOEs and POEs in the labor-intensive sector, assuming that SOEs are less productive than POEs but can borrow from banks with the gross interest rate R.

To incorporate SOE privatization and labor reallocation between SOEs and POEs within the labor-intensive sector into the model, we introduce SOEs as in Song, Storesletten, and Zilibotti (2011). Specifically, SOEs are financially integrated with the bank but are less productive than POEs. SOEs can rent capital from their representative financial intermediary at a fixed interest rate, R. Consequently, SOEs can survive in the short run despite inferior technology. Over time, however, labor will gradually reallocate from SOEs to POEs as the

capital stock of POEs expands. Thus, the economy features a transition stage during which SOEs and POEs coexist, but the share of output produced by SOEs (POEs) is shrinking (expanding). The technologies of the two types of firms follow constant returns to scale:

$$Y_{Ft}^l = \left(K_{Ft}^l\right)^\alpha \left(L_{Ft}\right)^{1-\alpha}, \; Y_{Et}^l = \left(K_{Et}^l\right)^\alpha \left(\chi L_{Et}\right)^{1-\alpha}, \tag{S50}$$

where the subscript "F" denotes SOEs and the the subscript "E" denotes POEs. In each period, an SOE firm maximizes profits by solving the following problem:

$$\max_{k_t^F, n_t^F} P_t^l Y_{Ft}^l - w_t L_{Ft} - R K_{Ft}^l, \tag{S51}$$

The first order conditions implies

$$\frac{K_{Ft}^l}{L_{Ft}} = \left(\frac{\alpha P_t^l}{R}\right)^{\frac{1}{1-\alpha}} \tag{S52}$$

$$W_t = (1-\alpha)\left(\frac{\alpha}{R}\right)^{\frac{\alpha}{1-\alpha}} \left(P_t^l\right)^{\frac{1}{1-\alpha}} \tag{S53}$$

Note that during transition, both wage rate, W_t, and the capital labor ratio of SOE firms, denoted as $\kappa_{Ft} \equiv \frac{K_{Ft}^l}{L_{Ft}}$ increase as P_t^l increases. Without loss of generality, we assume that the young entrepreneur of a POE firm can borrow from bank for capital investment. The POEs' capital stock is the sum of the young entrepreneur's saving and bank loan, $K_{Et}^l = s_t^m + B_{Et}^l$, where the incentive-compatibility for the entrepreneur implies that

$$R B_{Et}^l \leq \eta \rho_t^l \left(s_t^m + B_{Et}^l\right)$$

Assuming the incentive constraint is binding, we have

$$\frac{B_{Et}^l}{B_{Et}^l + s_t^m} = \frac{\eta \rho_t^l}{R} \tag{S54}$$

The problem of an old entrepreneur for POEs can be written as

$$\max_{L_{Et}} P_t^l \left(1-\psi\right)\left(K_{Et}^l\right)^\alpha \left(\chi L_{Et}\right)^{1-\alpha} - w_t L_{Et}.$$

The first order condition is

$$\left(1-\psi\right)\left(1-\alpha\right) P_t^l \left(K_{Et}^l\right)^\alpha \chi^{1-\alpha} L_{Et}^{-\alpha} = w_t \tag{S55}$$

This gives the rate of return for capital of POEs

$$\begin{aligned}
\rho_t^l &= \left(1-\psi\right)\alpha P_t^l \left(K_{Et}^l\right)^{\alpha-1} \left(\chi L_{Et}\right)^{1-\alpha} \\
&= \left(1-\psi\right)\alpha P_t^l \chi^{1-\alpha} \left(\frac{w_t}{\left(1-\psi\right)\left(1-\alpha\right) P_t^l \chi^{1-\alpha}}\right)^{\frac{1-\alpha}{\alpha}} \\
&= \left(1-\psi\right)^{\frac{1}{\alpha}} \chi^{\frac{1-\alpha}{\alpha}} R
\end{aligned}$$

where the second equality is obtained from (S55) and the third equality is obtained from (S53) . Therefore, along the initial stage of transition where there is surplus labor from SOEs, the rate of returns to capital for POEs is constant. In order for the young entrepreneur of POEs to invest in its own firm, we need to have $(1-\psi)^{\frac{1}{\alpha}}\chi^{\frac{1-\alpha}{\alpha}} > 1$, which implies the following assumption for the productivity of POEs

$$\chi > \underline{\chi} \equiv \left(\frac{1}{1-\psi}\right)^{\frac{1}{1-\alpha}} \tag{S56}$$

With (S54), this implies that POEs' borrowing increases during transition. Define $\kappa_{Et} \equiv \frac{K^l_{Et}}{\chi L_{Et}}$ as the ratio of capital to effective labor for POEs. Equations (S52) , (S53) and (S55) implies

$$\kappa_{Et} = \kappa_{Ft}\left((1-\psi)\chi\right)^{-\frac{1}{\alpha}}$$

That is, given that (S56) is satisfied, the SOEs are more capital-intensive than POEs. This is because easier access of bank credit for SOEs (financial repression) induced them to use capital more intensively than POEs.

Similar to our benchmark investment-driven economy, in this extended model, the price of capital-intensive intermediate input P^k_t decreases as the IC constraint is relaxed. According, P^l_t increases due to increasing demand for intermediate (labor-intensive) goods. An increase in P^l_t raises the marginal product of labor for both types of labor-intensive firms along the transition. Since SOEs are less productive than POEs, however, labor is reallocated from SOEs to POEs during the transition.[35] In this extended model, growth in aggregate output is sustained from two sources. One is capital deepening with the increasing investment-to-output ratio as capital is reallocated from the labor-intensive sector to the capital-intensive sector. The other source is an increase in endogenous aggregate TFP as labor is reallocated from SOEs to POEs within the labor-intensive sector.

E.2. **China's WTO Accession.** We now extend our investment-driven model to incorporate an explicit trade channel, exploring the effects of China's WTO accession on its macroeconomic development. The extended model differs from the gradualist case in two main aspects: L-firms export part of their labor-intensive goods, subject to an iceberg tariff, and the capital-intensive intermediate good is assumed to be a CES aggregator of domestically produced and foreign capital inputs.

Final goods are generated from an aggregator of the above two intermediate goods, with the constant elasticity of substitution (CES):

$$Y_t = \left[\varphi\left(Z^k_t\right)^{\frac{\sigma-1}{\sigma}} + \left(Z^l_t\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}.$$

[35] In Song, Storesletten, and Zilibotti (2011), the wage rate is constant during the transition; the equilibrium wage rate in our integrated framework increases as labor demand increases with P^l_t.

where Z_t^k and Z_t^l are capital-intensive and labor-intensive intermediate inputs. The perfect competitiveness in the final goods market implies the following first-order condition

$$Z_t^k = \left(\frac{\varphi}{P_t^T}\right)^{\sigma} Y_t. \tag{S57}$$

$$Z_t^l = \left(\frac{1}{P_t^l}\right)^{\sigma} Y_t \tag{S58}$$

where P_t^T is the price for capital-intensive intermediate goods. Normalizing the final goods price to one and using the zero-profit condition for final goods, we have

$$\left[\varphi^{\sigma}\left(P_t^T\right)^{1-\sigma} + \left(P_t^l\right)^{1-\sigma}\right]^{\frac{1}{1-\sigma}} = 1. \tag{S59}$$

E.2.1. *The Labor-Intensive Sector.* Without loss of generality, we assume that the old entrepreneur in the labor-intensive sector hires labor L_{Zt} and L_{Xt} to produce domestic and exported labor-intensive goods with the following Cobb-Douglas technology.

$$Z_t^l = \left(K_t^l\right)^{\alpha}\left(\chi_2 L_{zt}\right)^{1-\alpha}, \; X_t^l = \left(K_t^l\right)^{\alpha}\left(\chi_t L_{xt}\right)^{1-\alpha}, \tag{S60}$$

and

$$\chi_t = \chi_0 \left(L_{xt}\right)^{\chi_1}, \tag{S61}$$

with $\chi_0 > 0$, and $0 < \chi_1 < 1$. Equation (S61) captures the fact that production of exported good has learning-by-doing. The export sector faces an iceberg cost of tariff τ, such that the export price $P_{xt}^l = P_t^l/(1+\tau)$. Accordingly, the old entrepreneur's problem as

$$\Pi_t^l \equiv \max_{L_{zt}, L_{xt}} (1-\psi)\left(P_t^l Z_t^l + P_{xt}^l X_t^l\right) - R_t^l w_t \left(L_{xt} + L_{zt}\right) + (1-\delta) K_t^l \tag{S62}$$

subject to (S60) and(S61).

The first order conditions give

$$(1-\psi)(1-\alpha) P_t^l \left(K_t^l\right)^{\alpha} \chi_2^{1-\alpha} L_{zt}^{-\alpha} = w_t \tag{S63}$$

$$(1-\psi)(1-\alpha) P_{xt}^l \left(K_t^l\right)^{\alpha} \chi_t^{1-\alpha} L_{xt}^{-\alpha} = w_t \tag{S64}$$

Note that when the old entrepreneur chooses labor demand for export goods production, he does not internalize the effects of labor on labor efficiency χ_t. Plugging (S61) into (S64), we get

$$(1-\psi)(1-\alpha) P_{xt}^l \left(K_t^l\right)^{\alpha} \chi_0^{1-\alpha} L_{xt}^{\chi_1(1-\alpha)-\alpha} = w_t \tag{S65}$$

Hence, to make sure the demand curve for L_{xt} is downward sloping, we need to make the following parameter restriction.

$$\chi_1 < \frac{\alpha}{1-\alpha} \tag{S66}$$

Combining (S63) and (S65), we obtain labor allocation across domestic and exported labor-intensive goods

$$L_{xt} = (1+\tau)^{-\frac{1}{\alpha-\chi_1(1-\alpha)}} \left(\frac{\chi_0}{\chi_2}\right)^{\frac{1-\alpha}{\alpha-\chi_1(1-\alpha)}} (L_{zt})^{\frac{\alpha}{\alpha-\chi_1(1-\alpha)}} \tag{S67}$$

Equation (S67) indicates that a reduction in export tariff τ will reallocate labor toward production of exported goods.

E.2.2. *The Capital-Intensive Sector.* The capital-intensive intermediate goods is a CES aggregator of domestic and foreign capital goods

$$Z_t^k = \left[\phi_1 \left(Y_t^k\right)^{\frac{\rho-1}{\rho}} + \phi_2 \left(M_t^k\right)^{\frac{\rho-1}{\rho}}\right]^{\frac{\rho}{\rho-1}}$$

The first-order condition gives the demand function for domestic and foreign capital goods

$$Y_t^k = \left(\phi_1 \frac{P_t^T}{P_t^k}\right)^{\rho} Z_t^k \tag{S68}$$

$$M_t^k = \left(\phi_2 \frac{P_t^T}{P_t^F}\right)^{\rho} Z_t^k \tag{S69}$$

The zero-profit condition for capital-intensive intermediate goods implies

$$P_t^T = \left[\phi_1^{\rho} \left(P_t^k\right)^{1-\rho} + \phi_2^{\rho} \left(P_t^F\right)^{1-\rho}\right]^{\frac{1}{1-\rho}}$$

Finally, the problem of the representative domestic capital-good producer is the same as that of K-firms in the investment-driven economy.

E.2.3. *Workers' Problem.* We assume that workers endogenize their labor supply when young, with the utility specified as the GHH utility. The problem is simplified as

$$\max_{c_{1t}^w, c_{2t+1}^w} \frac{\left(c_{1t}^w - \mu_1 \frac{L_t^{1+\mu_2}}{1+\mu_2}\right)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} + \beta \frac{\left(c_{2t+1}^w\right)^{1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}}$$

subject to

$$\begin{aligned} c_{1t}^w + s_{t+1}^w &= w_t \overline{L}, \\ c_{2t+1}^w &= s_{t+1}^w R_{t+1}^D. \end{aligned}$$

The first-order conditions give

$$\begin{aligned} w_t &= \mu_1 L_t^{\mu_2} \\ s_{t+1}^w &= \frac{w_t L_t - \mu_1 \frac{L_t^{1+\mu_2}}{1+\mu_2}}{1+\beta^{-\gamma}(R_{t+1}^D)^{1-\gamma}} \end{aligned}$$

Nnote that the problems for the entrepreneur, the domestic K-firm, the bank, and the government are identical to those in the baseline investment-driven economy.

E.2.4. *Characterization of the Transition Path.* We first show that within the labor-intensive sector, the ratio of exported to domestic labor-intensive intermediate goods, i.e., $P_{xt}^l X_t^l / P_t^l Z_t^l$,, increases along transition path.

Lemma S2. *Along the transition path, the ratio of exported to domestic labor-intensive intermediate goods increases monotonically and equals to*

$$\frac{P_{xt}^l X_t^l}{P_t^l Z_t^l} = \left(\frac{\chi_t}{\chi_2}\right)^{\frac{1-\alpha}{\alpha}} \tag{S70}$$

Proof. See Internet Appendix F.8. □

Equation (S70) indicates that without learning-by-doing, the ratio of exports to domestic labor-intensive goods would be constant. However, the labor efficiency in exported goods χ_t increases due to learning-by-doing, which would cause L-firm to reallocate labor toward the exported good production.

Lemma S3. *Assume $\rho < \sigma$. Then the revenue ratio of domestically produced capital-intensive goods to domestically used labor-intensive goods, $P_t^k Y_t^k / P_t^l Z_t^l$, increases monotonically.*

Proof. See Internet Appendix F.9. □

The intuition for Lemma S3 is similar to the increasing revenue share of capital-intensive intermediate goods in our gradualist case. As K-firms accumulate net worth, more capital-intensive goods is produced and supplied, which causes the price of capital-intensive goods, P_t^k to declines. As a result, the representative firm that produces final good tends to substitute domestically produced capital-intensive goods for domestic labor-intensive goods.

To understand the dynamics of the share of export in GDP, we decompose it as follows

$$\frac{P_{xt}^l X_t^l}{GDP_t} = \frac{P_{xt}^l X_t^l}{P_t^l Y_t^l} \frac{P_t^l Y_t^l}{GDP_t} = \frac{P_{xt}^l X_t^l / P_t^l Z_t^l}{1 + P_{xt}^l X_t^l / P_t^l Z_t^l} \times \frac{P_t^l Y_t^l}{GDP_t} \tag{S71}$$

Where $P_t^l Y_t^l \equiv P_{xt}^l X_t^l + P_t^l Z_t^l$. Equation (S71) suggests that as long as the increase of $P_{xt}^l X_t^l / P_t^l Z_t^l$ is fast enough, export as a share of GDP will increase despite a secular decline in $\frac{P_t^l Y_t^l}{GDP_t}$, as predicted by Lemma S3.

Appendix F. Proofs of Propositions

F.1. **Proof of Proposition S1.** We first show that when $N_t = 0$, the IC constraint (2) is binding. By contradiction, suppose the IC constraint is nonbinding. This implies that the following inequality holds:

$$(1-\psi)\theta P_t^l \left(K_t^l\right)^{\alpha} \left(\chi L_t\right)^{1-\alpha} \geq R_t^l \left(w_t L_t + R K_t^k\right).$$

If (2) is not binding, however, $P_t^l \left(K_t^l\right)^{\alpha} \left(\chi L_t\right)^{1-\alpha} = R_t^l \left(w_t L_t + R K_t^k\right)$. With $\theta < 1$, the above inequality does not hold unless $\theta = 1$. A contradiction.

Now we consider the case in which $N_t > 0$ and the IC constraint is nonbinding. Substituting (S3) and (S5) into (2), we have

$$K_t^l \leq \frac{\alpha}{R} \frac{N_t}{(1-\theta)},$$

and

$$P_t^l = R_t^l \left(\frac{R_t}{\alpha}\right)^{\alpha} \left(\frac{w_t}{(1-\alpha)\chi}\right)^{1-\alpha}.$$

We again establish a contradiction.

F.2. **Proof of Proposition S2.** Combining equations (S9) and (S34) leads to

$$N_{t+1} = \xi K_t^l \left(\frac{\chi(1-\alpha)R}{\alpha \underline{w}}\right)^{1-\alpha} \varphi^{\sigma} \left(\frac{P_t^l}{P_t^k}\right)^{\sigma}.$$

Substituting the above equation into (S13) and forwarding the resultant equation by one period, we have

$$\begin{aligned} K_{t+1}^l &= \frac{\alpha}{R} \frac{R^l \xi \left(\frac{\chi(1-\alpha)R}{\alpha \underline{w}}\right)^{1-\alpha} \varphi^{\sigma} \left(\frac{P_t^l}{P_t^k}\right)^{\sigma}}{R^l - \theta(1-\psi) P^l \left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha} \left(\frac{\alpha}{R}\right)^{\alpha}} K_t^l \\ &= g_A K_t^l, \end{aligned}$$

where

$$g_A \equiv \frac{\alpha}{R} \frac{R^l \xi \left(\frac{\chi(1-\alpha)R}{\alpha \underline{w}}\right)^{1-\alpha} \varphi^{\sigma} \left(\frac{P_t^l}{P_t^k}\right)^{\sigma}}{R^l - \theta(1-\psi) P^l \left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha} \left(\frac{\alpha}{R}\right)^{\alpha}}.$$

[36]. For K_t^k, it follows from (S34) that

$$\frac{K_{t+1}^k}{K_t^k} = \frac{K_{t+1}^l}{K_t^l},$$

From equation (S3) one can see that

$$\frac{L_{t+1}}{L_t} = \frac{K_{t+1}^k}{K_t^k}.$$

For the growth rate of bank loan to labo-intensive sector, since

$$B_t^l = \frac{R^l}{R^l - \theta(1-\psi) P^l \left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha} \left(\frac{\alpha}{R}\right)^{\alpha}} N_t$$

[36]For $g_A > 0$, we need the parameter restriction

$$\frac{R}{\alpha} > (1-\psi)\theta P^l \left(\frac{\chi(1-\alpha)R}{\alpha \underline{w}}\right)^{1-\alpha},$$

which always holds in our numerical exercises.

we have

$$\frac{B_{t+1}^l}{B_t^l} = \frac{N_{t+1}}{N_t} = \frac{K_t^l}{K_{t-1}^l} = g_A$$

Finally, the growth rate of aggregate output can be decomposed as

$$\begin{aligned}
\frac{Y_{t+1}}{Y_t} &= \frac{P_{t+1}^l Y_{t+1}^l}{P_t^l Y_t^l} \times \frac{P_t^l Y_t^l}{Y_t} + \frac{P_{t+1}^k Y_{t+1}^k}{P_t^k Y_t^k} \times \frac{P_t^k Y_t^k}{Y_t} \\
&= \frac{K_{t+1}^l}{K_t^l} \times \frac{P_t^l Y_t^l}{Y_t} + \frac{K_{t+1}^k}{K_t^k} \times \frac{P_t^k Y_t^k}{Y_t} \\
&= g_A
\end{aligned}$$

F.3. **Proof of Proposition S3.** For the labor-intensive sector, the investment rate is

$$\begin{aligned}
\frac{I_t^l}{P_t^l Y_t^l} &= \frac{K_{t+1}^l}{P_t^l Y_t^l} \\
&= \frac{g_A K_t^l}{P_t^l K_t^l \left(\frac{(1-\alpha)\chi R}{\underline{w}\alpha}\right)^{1-\alpha}} \\
&= \frac{g_A}{P^l \left(\frac{(1-\alpha)\chi R}{\underline{w}\alpha}\right)^{1-\alpha}}.
\end{aligned}$$

where the second equality comes from Proposition S2 and equation (S4).

For the capital-intensive sector, the investment rate is

$$\begin{aligned}
\frac{I_t^k}{P_t^k Y_t^k} &= \frac{K_{t+1}^k}{P_t^k Y_t^k}, \\
&= \frac{K_{t+1}^l \left(\frac{\chi(1-\alpha)R}{\alpha w_{t+1}}\right)^{1-\alpha} \varphi^\sigma \left(\frac{P_{t+1}^l}{P_{t+1}^k}\right)^\sigma}{P_t^k Y_t^l \varphi^\sigma \left(\frac{P_t^l}{P_t^k}\right)^\sigma}, \\
&= \frac{K_{t+1}^l}{P_t^k K_t^l}, \\
&= \frac{g_A}{P^k},
\end{aligned}$$

where the second equality comes from equations (S34) and (S1) and the third equality follows from (S4). With the constant revenue share in each sector, therefore, the aggregate investment rate is constant.

For bank loans, we substitute (S13) and (S34) into (S35), which yields

$$\begin{aligned}\frac{B_t^k}{B_t^l} &= \frac{\left(\frac{\alpha}{R}\frac{R_t^l\left(\frac{\chi(1-\alpha)R}{\alpha w_t}\right)^{1-\alpha}\varphi^\sigma\left(\frac{P_t^l}{P_t^k}\right)^\sigma}{R_t^l-\theta_t(1-\psi)P_t^l\left(\frac{(1-\alpha)\chi}{w_t}\right)^{1-\alpha}\left(\frac{\alpha}{R}\right)^\alpha}-1\right)N_t}{\frac{R_t^l}{R_t^l-\theta_t(1-\psi)P_t^l\left(\frac{(1-\alpha)\chi}{w_t}\right)^{1-\alpha}\left(\frac{\alpha}{R}\right)^\alpha}N_t} \\ &= \left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha}\left(\frac{\alpha}{R}\right)^\alpha\varphi^\sigma\left(\frac{P^l}{P^k}\right)^\sigma-\left(1-\theta(1-\psi)\frac{P^l}{R^l}\left(\frac{(1-\alpha)\chi}{\underline{w}}\right)^{1-\alpha}\left(\frac{\alpha}{R}\right)^\alpha\right).\end{aligned}$$

This ratio is therefore constant during the transition.

F.4. **Proof of Proposition S4.** We rewrite equation (S38) as

$$\begin{aligned}TFP_t &= \frac{P_t^kY_t^k+P_t^lY_t^l}{\left(K_t^k+K_t^l\right)^\alpha\overline{L}^{1-\alpha}} \\ &= \frac{\left[P_t^k\varphi^\sigma\left(\frac{P_t^l}{P_t^k}\right)^\sigma+P_t^l\right]Y_t^l}{\left[K_t^l\left(\left(\frac{\chi(1-\alpha)R}{\alpha w_t}\right)^{1-\alpha}\varphi\left(\frac{P_t^l}{P_t^k}\right)^\sigma+1\right)\right]^\eta\overline{L}^{1-\eta}} \\ &= \frac{\left[P_t^k\varphi^\sigma\left(\frac{P_t^l}{P_t^k}\right)^\sigma+P_t^l\right]\left(\frac{w_t\alpha}{(1-\alpha)\chi R}\right)^\alpha L_t}{\left[\left(\frac{w_t\alpha}{(1-\alpha)\chi R}\right)\left(\left(\frac{\chi(1-\alpha)R}{\alpha w_t}\right)^{1-\alpha}\varphi^\sigma\left(\frac{P_t^l}{P_t^k}\right)^\sigma+1\right)L_t\right]^\eta\overline{L}^{1-\eta}} \\ &= A\left(\frac{L_t}{\overline{L}}\right)^{1-\eta},\end{aligned}$$

where

$$A\equiv\frac{\left[P^k\varphi^\sigma\left(\frac{P^l}{P^k}\right)^\sigma+P^l\right]\left(\frac{w_t\alpha}{(1-\alpha)\chi R}\right)^{\alpha-\eta}}{\left[\left(\frac{\chi(1-\alpha)R}{\alpha\underline{w}}\right)^{1-\alpha}\varphi^\sigma\left(\frac{P^l}{P^k}\right)^\sigma+1\right]^\alpha}.$$

The second equality is derived by substituting (S1) into (S34), the third equality comes from (S3), and the last equality holds because $w_t=\underline{w}$ during the transition. It follows that

$$\begin{aligned}\frac{TFP_{t+1}}{TFP_t} &= \left(\frac{L_{t+1}}{L_t}\right)^{1-\eta} \\ &= g_A^{1-\eta},\end{aligned}$$

where the second equality follows from Proposition S2.

F.5. **Proof of Proposition S5.** The first order condition for the old entrepreneur's problem implies the following labor demand function

$$L_t=K_t^l\left(\frac{P_t^l(1-\psi)(1-\alpha)\chi^{1-\alpha}}{w_t}\right)^{\frac{1}{\alpha}}. \tag{S72}$$

Plugging (S72) into L-firms' production function, we have

$$Y_t^l = K_t^l \left(\frac{\chi (1-\psi)(1-\alpha) P_t^l}{R_t^l w_t} \right)^{\frac{1-\alpha}{\alpha}} \tag{S73}$$

Hence,

$$\begin{aligned} K_{t+1}^l &= \frac{m_t}{1+\beta^{-\gamma}} \\ &= \psi \left(P_t^l\right)^{\frac{1}{\alpha}} \left(\frac{(1-\psi)(1-\alpha)\chi}{w_t} \right)^{\frac{1-\alpha}{\alpha}} K_t^l \end{aligned} \tag{S74}$$

where the second equality is obtained by plugging (S72) into $m_t = \psi \left(K_t^l\right)^{\alpha} (\chi L_t)^{1-\alpha}$. When $L_t \leq \overline{L}$, $w_t = \underline{w}$. Hence, equation (S48) holds.

F.6. **Proof of Lemma S1.** In the light-industry led economy, with the binding incentive constraint

$$(1-\psi) P_t^l \left(\frac{(1-\alpha)\chi}{w_t} \right)^{1-\alpha} \left(\frac{\alpha}{R} \right)^{\alpha} > R^l$$

Plugging the above inequality into equation (S36), we have

$$g_A > \frac{\xi \left(\frac{(1-\alpha)\chi}{\underline{w}} \right)^{1-\alpha} \left(\frac{\alpha}{R} \right)^{\alpha} \varphi \left(\frac{P^l}{P^k} \right)^{\sigma}}{1-\theta} \equiv \widehat{g}_A.$$

Therefore, for $g_A > \widetilde{g}_A$, it is sufficient that $\widehat{g}_A > \widetilde{g}_A$, which gives (S49).

F.7. **Proof of Proposition S6.** We first prove that the aggregate investment rate declines over the post-transition stage. The aggregate investment-output ratio can be decomposed as

$$\frac{I_t}{Y_t} = \frac{I_t^k}{P_t^k Y_t^k} \frac{P_t^k Y_t^k}{Y_t} + \frac{I_t^l}{P_t^l Y_t^l} \frac{P_t^l Y_t^l}{Y_t}$$

We first show that the revenue share of each sector $P_t^j Y_t^j / Y_t$ for $j \in \{k, l\}$ is constant. Note that

$$\frac{P_t^k Y_t^k}{P_t^l Y_t^l} = \varphi^{\sigma} \left(\frac{P_t^k}{P_t^l} \right)^{1-\sigma}$$

Since both P_t^k and P_t^l are constant, the ratio of revenue in these two sectors and thus the revenue shares in each sector is constant. We now prove the investment rate in the capital-intensive sector is declining, while that in the labor-intensive sector is constant. For

investment rate in the labor-intensive sector, we have

$$\begin{aligned}\frac{I_t^l}{P_t^l Y_t^l} &= \frac{K_{t+1}^l}{P_t^l K_t^l \left(\frac{\chi(1-\psi)(1-\alpha)P_t^l}{R_t^l w_t}\right)^{\frac{1-\alpha}{\alpha}}} \\ &= \frac{\widetilde{g}_{A,t} K_t^l}{P_t^l K_t^l \left(\frac{\chi(1-\psi)(1-\alpha)P_t^l}{R_t^l w_t}\right)^{\frac{1-\alpha}{\alpha}}} \\ &= \frac{\psi}{1+\beta^{-\gamma}},\end{aligned}$$

where the first equality is obtain by plugging (S72) into L-firm's production function, the second and third equality are obtained by plugging (S48) . For investment rate in the capital-intensive sector, we have

$$\begin{aligned}\frac{I_t^k}{P_t^k Y_t^k} &= \frac{Y_{t+1}^l \varphi^\sigma \left(\frac{P_{t+1}^l}{P_{t+1}^k}\right)^\sigma}{P_t^k Y_t^l \varphi^\sigma \left(\frac{P_t^l}{P_t^k}\right)^\sigma} \\ &= \frac{K_{t+1}^l \left(\frac{\chi(1-\psi)(1-\alpha)P_{t+1}^l}{R_{t+1}^l w_{t+1}}\right)^{\frac{1-\alpha}{\alpha}}}{P_t^k K_t^l \left(\frac{\chi(1-\psi)(1-\alpha)P_t^l}{R_t^l w_t}\right)^{\frac{1-\alpha}{\alpha}}} \\ &= \frac{\psi}{1+\beta^{-\gamma}} \frac{P_t^l}{P_t^k} \left(\frac{\chi\left(1-\psi\right)\left(1-\alpha\right)P_{t+1}^l}{w_{t+1}}\right)^{\frac{1-\alpha}{\alpha}}\end{aligned}$$

where the first equality is obtained by plugging (S1) , the second equality is obtained by plugging (S4) and the third equality is obtained by plugging (S74) . Since w_{t+1} increases during the post-transition stage, $I_t^k/(P_t^k Y_t^k)$ declines over time. Therefore aggregate investment rate I_t/Y_t declines over time.

The labor income share

$$\begin{aligned}\frac{w_t L_t}{Y_t} &= \frac{w_t L_t}{P_t^k Y_t^k + P_t^l Y_t^l} \\ &= \frac{w_t L_t / P_t^l Y_t^l}{P_t^k Y_t^k / P_t^l Y_t^l + 1}\end{aligned}$$

Since $w_t L_t / P_t^l Y_t^l = (1-\psi)(1-\alpha)$, $P_t^k Y_t^k / P_t^l Y_t^l$ is constant in the post-transition stage, the labor income share is constant. To prove that capital is reallocated toward labor-intensive sector is equivalent to prove that

$$\frac{K_{t+1}^k}{K_t^k} < \frac{K_{t+1}^l}{K_t^l} \tag{S75}$$

Equation

$$\begin{aligned}\frac{K_{t+1}^l}{K_t^l} &= \frac{Y_{t+1}^l\left(\frac{R_{t+1}^l w_{t+1}}{\chi(1-\psi)(1-\alpha)P_{t+1}^l}\right)^{\frac{1-\alpha}{\alpha}}}{Y_t^l\left(\frac{R_t^l w_t}{\chi(1-\psi)(1-\alpha)P_t^l}\right)^{\frac{1-\alpha}{\alpha}}} \\ &= \frac{Y_{t+1}^l}{Y_t^l}\left(\frac{w_{t+1}P_t^l}{w_t P_{t+1}^l}\right)^{\frac{1-\alpha}{\alpha}} \\ &= \frac{Y_{t+1}^k}{Y_t^k}\left(\frac{P_{t+1}^k/P_{t+1}^l}{P_t^k/P_t^l}\right)^{\sigma}\left(\frac{w_{t+1}P_t^l}{w_t P_{t+1}^l}\right)^{\frac{1-\alpha}{\alpha}} \\ &= \frac{K_{t+1}^k}{K_t^k}\left(\frac{P_{t+1}^k/P_{t+1}^l}{P_t^k/P_t^l}\right)^{\sigma}\left(\frac{w_{t+1}P_t^l}{w_t P_{t+1}^l}\right)^{\frac{1-\alpha}{\alpha}} \end{aligned} \tag{S76}$$

where the first equality is obtained by using (S4), the third equality is obtained by using (S1) . In the post-transition stage, since $L_t = 1$, equation (S72) gives

$$w_t = (1-\psi)(1-\alpha)P_t^l\chi\left(K_t^l/\chi\right)^{\alpha} \tag{S77}$$

Plugging (S77) into (S76) and reordering, we obtain

$$\begin{aligned}\frac{K_{t+1}^k}{K_t^k} &= \left(\frac{K_{t+1}^l}{K_t^l}\right)^{\alpha}\left(\frac{P_t^k/P_t^l}{P_{t+1}^k/P_{t+1}^l}\right)^{\sigma} \\ &= \left(\frac{K_{t+1}^l}{K_t^l}\right)^{\alpha}\end{aligned}$$

Since $\frac{K_{t+1}^l}{K_t^l} > 1$ and $\alpha < 1$, the inequality (S75) holds. Hence, capital is reallocated from the capital-intensive to the labor income sector.

F.8. **Proof of Lemma S2.** Equation (S64) and (S63) implies

$$\frac{L_{zt}}{L_{xt}} = \left(\frac{\chi_2}{\chi_t}\right)^{\frac{1-\alpha}{\alpha}} \tag{S78}$$

The ratio of exported to domestic labor-intensive goods follows

$$\frac{P_{xt}^l X_t^l}{P_t^l Z_t^l} = \left(\frac{\chi_t}{\chi_2}\frac{L_{xt}}{L_{zt}}\right)^{1-\alpha} = \left(\frac{\chi_t}{\chi_2}\right)^{\frac{1-\alpha}{\alpha}}$$

F.9. **Proof of Lemma S3.** Equation (S68) implies

$$\frac{P_t^k Y_t^k}{P_t^T Z_t^k} = \phi_1^{\rho}\left(\frac{P_t^T}{P_t^k}\right)^{1+\rho} \tag{S79}$$

Equation (S57) and (S58) imply

$$\frac{P_t^T Z_t^k}{P_t^l Z_t^l} = \varphi^{\sigma}\left(\frac{P_t^l}{P_t^T}\right)^{1+\sigma} \tag{S80}$$

Combining equation (S79) and (S80), we have

$$\begin{aligned}\frac{P_t^k Y_t^k}{P_t^l Z_t^l} &= \left(\frac{P_t^T}{P_t^k}\right)^{\rho+1}\left(\frac{P_t^l}{P_t^T}\right)^{\sigma+1}\phi_1^\rho\varphi^\sigma \\ &= \left(\frac{1}{P_t^k}\right)^{\rho+1}\left(P_t^l\right)^{\sigma+1}\left(\frac{1}{P_t^T}\right)^{\sigma-\rho}\phi_1^\rho\varphi^\sigma \end{aligned} \tag{S81}$$

Along the transition path, both P_t^k and P_t^T decline, while P_t^l increases. Hence the first and second arguments on the right-hand-size of (S81) increases over time. Also, Moreover, $\sigma > \rho$ makes sure the third argument increases along the transition.

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