

Weak links: the Zambian economy, step by step

Every step is a promise. The broken ones are worth most.

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Working draft v6.1, 4 October 2026

ABSTRACT

This paper asks three questions of any chain in the Zambian economy. Which one step holds it back? This page's conjecture: a promise owed by someone who pays nothing when it breaks. Who owns it? Often a public body, and when cash is short the state pays in the order of what breaking each promise costs it. On the Treasury's own table, farmers and the state's own utilities were paid in full, ordinary suppliers a third, road contractors one percent. Who pays when it fails? The creditor. Verified domestic arrears reached K84 billion in 2025, and carrying them saves the Treasury more in interest than it budgets to clear them. The rule is tested against cash alone and first come, first served, and the cases that do not fit are reported. The same arithmetic says where a fix would pay most; section 08 says what has become cheap and whose hands each fix needs.

Keywords: weak links; O-ring; promises and enforcement; domestic arrears; trade credit; warehouse receipts; records and AI; Zambia. **JEL:** O17, L14, H63, G21, Q13, O33, O55.

* Working draft, revised as evidence arrives; the version history is in Appendix C. The interactive version, with a tool to score a chain and calculators for the theory, is at zamai.pro/weak-links. Cite as: Lindinger, C. (2026). Weak links: the Zambian economy, step by step. Working draft v6.1. zamai.pro/weak-links. Bodies are named in the text and in the references; where a figure is derived rather than quoted, the text says so; observations from the mill are the author's own and are marked. Corrections to chris@zamai.pro.

1. Losses multiply

And the weakest step is where a fix pays most

A bag of meal on a shelf in Lusaka is the end of a chain. Grain was bought at harvest, stored, powered, milled, certified, packed, delivered and paid for. Each step lost a little. A week's delay. A lot that spoiled. A generator run through a power cut. A refund that took a year. None of the losses is large. All of them are still in the bag.

Each step keeps a share of what reaches it, so the shares multiply. Eight steps at 90 percent deliver 43 percent. Let one work at 50 and the chain falls to 24. Fix that step and the chain nearly doubles; make a good step perfect instead and 24 becomes 27. Point for point, a gain at the weak step is worth almost twice as much, so start there, if a point costs about the same everywhere. Often it does not: a step is often weak because it was hard to fix.

What matters is that the steps depend on each other. In 1986 the shuttle *Challenger* was lost to one rubber seal that failed in the cold, and in 1993 Michael Kremer used that failure to explain why poor and rich countries are so far apart: a weak step lowers the value of every strong one, and the best-run firm loses most.^{1,2} The shuttle is the extreme case. The bag of meal is the ordinary one.

That is why so many Zambians trade. In 2013, the last time it was measured, 39 percent of adults were starting or running a business; owners in business for over three and a half years were under a tenth of that.³ A trader's chain has three steps: buy, move, sell. A maker's has ten: inputs, power, processing, certification, packing, delivery, payment, refunds, and the permits in between. At 90 percent a step, the

trader's chain delivers 73 percent, the maker's about a third. The count depends on how steps are drawn. The gap does not.

At 90 percent a step

Chain	Steps	Delivered	Arithmetic
Trader: buy, move, sell	3	73%	$0.9 \times 0.9 \times 0.9 = 0.729$
Maker: inputs, power, processing, certification, packing, delivery, payment, refunds, permits	10	35%	0.9 to the power of 10 = 0.349

Share of the value delivered when every step keeps 90 percent: 0.9 to the power of 3 and of 10 (this page's arithmetic).

The border should help. Zambia is landlocked, so every import carries the freight, and on paper a maker selling at home starts with that cushion. On the shelf it does not show: the supermarket chains stock what their South African buyers list, and imports from Asia land below local cost (the author's observation from the mill). Every imported input and every export pays the freight too. Trading is not a lack of ambition. Here it is the sensible calculation.

Which one step holds this chain back? Who owns it? And who pays when it fails?

That finds the step where a point is worth most. It does not say why that step loses so much here, or whether it can be mended at all. So look at what a step is.

2. A step is a promise

And a promise binds in proportion to what it costs to break it

Look closely at any step and it is a promise between two parties. Deliver by Friday. Pay in thirty days. Approve within the statutory period. Refund the tax. A step works when the promise is kept on the date, and loses when it is kept late, in part, or not at all. The losses down a Zambian chain are promises that do not bind: the unpaid bill, the refund that never arrives, the permit with no deadline, the loan nobody collects.

A promise is kept when breaking it costs the promiser more than keeping it. That cost comes from four places, the same four throughout this page. **Exit:** a customer who leaves, a supplier who stops, a counterparty who can walk away. **A court** the other side can actually use. **Visibility:** a break seen by someone who matters to the promiser. **Self-execution:** money that moves on its own, a deduction at source, a key that does not turn.

A promise binds in proportion to what it costs the promiser to break it. When cash is short, the state pays in the order of what breaking each promise costs it.

The second sentence is the first under pressure, tested here against two simpler rules: cash alone, which squeezes every creditor together, and first come, first served. The rule is not new. A sovereign's promise is believed when something can make breaking it costly to the sovereign; where courts are weak, trade runs on relationships whose future is worth more than a broken promise.^{4,5} What this page adds is the Zambian record.

The mechanism decides, not the intention. The United States cut its payment time to small contractors from thirty days to fifteen; payroll at those firms rose ten cents for every dollar paid sooner, partly offset by fewer jobs at other firms where labour was scarce.⁶ Europe wrote the same right into law, with interest after thirty days, and less changed than intended: a small firm will not claim interest from a payer it depends on.⁷ The promise bound where breaking it cost the payer automatically, not where the

supplier had to dare to ask. The United States was not short of cash, so the lesson carries only to arrears a Treasury could pay.

Two qualifiers. A target is not a promise: it has no counterparty and no cost for missing it. Once someone pays for missing it, it has become a promise. And some promises no decision can keep. In February 2026 the National Health Insurance Management Authority (NHIMA), the state health insurer, owed clinics K500 to 600 million against a 45-day contract, and said it did not have the money.⁸ Raising the cost of breaking that promise would only move the loss to another creditor. This page is about the promises that could be kept and are not: the steps where the fix is a decision, not money. Those are the ones worth finding first.

From the mill. Yumi Milling paid its data-protection registration fee. Nothing came back: no permit and no receipt, after repeated calls and emails. The receipt is the promise. A firm that did that to the state would be fined.

3. Who owns the step

The state's order of payment

This page's conjecture is that many of the steps that hold a Zambian chain back are owned by a public body and end in a payment. So who owns the step becomes: in what order does the state pay? The law writes part of the order down. Public debt is a charge on the Consolidated Fund, pensions are to be "paid promptly and regularly", statutory payments come first, and the rest is released at the Treasury's discretion.^{9,10} The Zambian record shows the order with unusual clarity: one administration paying the bills of two.

The Treasury's 2024 arrears strategy states four principles for which old bills it clears first, in its own words: "arrears related to critical services with social impact", which it says entails paying "contractors offering discounts to the Government on their claims"; arrears "where refinancing at a cheaper cost is possible"; "first in first out", older bills before newer; and "local suppliers of goods and services", whose bills are smaller than external contractors'.¹¹ They are not presented as a ranking. The same strategy then sorts everything still owed in March 2024 into five numbered categories, each with a year by which it is to be cleared (its Table 2.0). It also shows what each kind of creditor was owed at the end of 2021, and what was paid in the next 27 months:

The Treasury's table as bars, highest share first. Colour is the Treasury's own 2024 sorting of what was still owed into five categories, lighter for the earlier ones; the two classes it had already cleared are lightest, and the class with nothing owed at the end of 2021 has no share. Shares are this page's arithmetic on Table 1.0; the table below is the data.¹¹

Owed at end 2021 to	Owed, K m	Paid, K m	Share	Coded cost of breaking	Treasury's category, 2024
Farmers, through the Food Reserve Agency (FRA), the state grain buyer	2,060	2,060	100%	Crowd	Cleared
The state's own utilities: ZESCO, Zamtel and the water companies three rows in the Treasury's table	643	643	100%	Supply	Cleared
Input suppliers to FISP, the farm input subsidy	1,666	1,632	98%	Supply, crowd	1, in 2024
Pensioners	1,318	1,060	80%	Law, crowd	1, in 2024
People who won in court	3,907	2,282	58%	Court	2, in 2024
Suppliers of rations	359	149	41%	Supply	2, in 2024
Independent power producers, through ZESCO paid by ZESCO from its own revenues; K18,985m written down by negotiation	48,475	17,305	36%	Supply	3, to mid-2026
Firms owed VAT refunds	10,368	3,508	34%	None	3, to 2025
Ordinary suppliers of goods and services	6,304	2,034	32%	None	2, to 2029
Capital projects	3,237	753	23%	None	4, to 2029
Its own staff, for allowances	9,211	1,801	20%	Crowd	2, to 2029
Fuel suppliers	11,397	1,645	14%	Supply, penalty	5, refinanced in 2024
Road contractors	8,982	98	1.1%	Penalty	4, to 2029
Contractors on cancelled foreign loans no stock at end 2021; K12,200m fell due when the loans were cancelled	0	0	no share	None stated	4, to 2028

Treasury arrears strategy 2024, Table 1.0, all fourteen creditor classes, with its three utility rows (phone, power, water) merged into one: payments January 2022 to March 2024 beside the end-2021 stock. The Treasury's own subtotal covers the twelve domestic classes, K59.5 billion owed and K17.7 billion paid; it carries the power producers separately, as a contingent liability paid by ZESCO, the state power utility, and the contractors on cancelled loans as a new class. Shares and coding are this page's. Where payment equals the stock it went to the old bills; elsewhere some may have gone to newer ones. The last column is the Treasury's own sorting, in August 2024, of what was still owed into five categories with a clearance horizon each (Table 2.0); farmers and the utilities were already cleared and have none. The rank correlation of each column with the share paid is in Appendix B.

The coded column tests five things: a duty with priority written in law (**law**); a creditor who can stop something the state needs within the season (**supply**); a large group that votes or protests together (**crowd**); a court order (**court**); a claim that grows by contract while it waits (**penalty**). The tests were written after the percentages were known, so the coding is not blind. The contractors on cancelled loans have no end-2021 stock, so no share to test, and are left out of the correlations.

Read honestly, the table half fits. Every class paid 80 percent or more scores on a test; every class that scores on none was paid about a third or less. The big misses are fuel and roads. Fuel suppliers could stop supply and held penalty clauses, and were paid 14 percent; their bill grew until interest and penalties exceeded the principal, and they were cleared in 2024 and 2025 with bank loans.¹² Road contractors held interest clauses and were paid one percent.¹³ A penalty the creditor cannot execute against the State (section 05) adds to the bill, not to the pressure. The VAT row, coded none, was paid 34 percent though the mines held most of the refund stock. Two simpler rules compete. First come, first served does not fit: every row is the same end-2021 stock, and the shares run from 1 to 100. Cash alone fits better than this page's coding: seven of the thirteen classes received between K1.6 billion and K3.5 billion whatever they were owed, so the share paid falls with the size of the bill. The nearest thing to a blind test is the Treasury's own 2024 sorting of what was still owed into five categories, and it fits the shares best: category 1 for its "considerable social economic impact", category 5, fuel, "the most costly

category to the Government”, numbered last and refinanced first.¹¹ Two cautions. The categories were written in August 2024, after the payments in the table; and a Treasury describing good triage and a Treasury paying in the order of what hurts it write the same list.

As a creditor, the state already shows which promises bind here: from the mill, the public systems that improved most are the ones that collect by deduction or before the service, promises that execute themselves. Where it must chase, it does not: taxpayers owed the Zambia Revenue Authority (ZRA) K71.3 billion at the end of 2025, and the Citizens Economic Empowerment Commission (CEEC), the state’s enterprise fund, had no repayments by the end of 2024 on K394 million lent.^{14,15}

One correction to the question itself. “Who owns the step” is rarely answered by “the state”. The state is not one organisation with one will. It is the Treasury, line ministries, agencies, the Bank of Zambia and a governing party, each bound by a different cost. The Food Reserve Agency (FRA), the state grain buyer, shows it across its 2025 and 2026 seasons: the Treasury wrote to the IMF, the state’s lender under its 2022 to 2026 programme, that the FRA would buy at market-based prices and be funded only within the budget;¹² the agriculture ministry and the FRA bought four times the plan.^{16,17} Each kept the promise that would have cost it most to break. An outside sanctioner binds the part of the state it measures, the Treasury, and not the parts it does not. So the question for any chain is not whether the state will keep a promise, but which part of the state owns the step, and what breaking it costs that part.

What the table cannot show, pairs can: the same creditor, with only the cost of breaking changed.

4. Same creditor, different cost

Hold the creditor fixed and move the cost. The promise moves with it.

If cash alone decides, a promise moves with the cash. If the rule is right, it moves with the cost of breaking it, even when the creditor stays the same.

The farmers, two seasons

Same creditor, two clocks: July to December

Year	Date	Event
2025	July	Deliveries begin
2025	5 November	FRA owes farmers more than K7 billion; K5 billion bank facility secured on its maize
2025	10 December	July deliveries still unpaid
2026	13 July	FRA told to pay on the spot
2026	13 August	General election
2026	28 August	Over a million tonnes bought, over K6 billion paid

Same buyer, same farmers: delivery to payment, 2025 against 2026. The vote was on 13 August 2026.^{18,19,20}

Same buyer, same farmers. In 2025, July deliveries were still unpaid in December.¹⁸ The minister cited a bumper harvest and too few private buyers; the FRA owed farmers more than K7 billion and settled with a K5 billion bank facility secured on its own maize.^{19,12} In 2026, an election year, the FRA was told in July to pay on the spot. By 28 August, two weeks after the vote on 13 August, it had bought over a million tonnes and paid over K6 billion, most of what it then owed: a million tonnes at K347 a bag is about K6.9 billion (this page’s arithmetic).²⁰ One season pair is not a pattern, and the planting season binds too: the 2021 arrears to farmers were paid in full in 2022 to 2024, with no vote near. The Fund’s published reading, in January 2026: the FRA’s purchase prices “are typically set just below prevailing market price levels, but have been set above market prices in the last three elections cycles”, and “when

budget allocations are insufficient, the cost is shifted to farmers through arrears accumulation”.¹² For 2026 the FRA’s board promised to process payments “within three days of grain delivery”.²¹ One unpublished observation, the author’s own from the maize trade in Southern Province and to be weighed as such: within weeks of the vote, farmers were complaining of non-payment again.

The same season shows what a target is worth. In its letter to the Fund in late 2025 the government wrote that it would fund the FRA only in line with budget commitments, and that it would buy “at market-based prices”;¹² its agricultural transformation programme proposes reviewing the FRA’s mandate “with a view to reverting” to reserves and last-resort buying.²² In May 2026 the FRA planned at least 500,000 tonnes; by the close on 30 September it had bought over 2 million.^{16,17} The budget for maintaining strategic food reserves was K2.1 billion; 2 million tonnes at K347 a bag is about K14 billion (this page’s arithmetic).^{23,21} A firm that planned on the announced step back planned on a target. The letter was the Treasury’s promise and the buying was the ministry’s and the FRA’s; each kept the promise that would have cost it most to break.

Salaries and allowances

The state’s own staff are one creditor with two promises. In September 2025 the finance minister said central government salaries had been paid “consistently and on time” since 2021, with one exception, the August 2025 payday, which he put down to a technical glitch; that is his claim, and no counter-claim was found.²⁴ Allowances owed to the same staff were 20 percent paid. Every household sees the payday; an allowance is a claim one person makes alone. Salaries paid through grants bind less: through 2024, staff at the University of Zambia (UNZA) were paid late because the monthly grant came late.²⁵

Pressure from outside

The IMF programme of 2022 to January 2026 was the largest outside cost placed on the state, and it bound what it measured. New foreign arrears sat under a performance criterion that could stop a disbursement; domestic arrears under an indicative target, which cannot. The target was missed at June 2025 and met at September, because the fuel operation counted.¹² In 2023 the cash balance improved “including on the back of accumulation of expenditure arrears”; when foreign debt payments resumed in 2025, goods and services were cut by about one percent of GDP.^{26,27} The programme ended in January 2026; talks on a successor opened on 30 September.²⁸ Between programmes, even the target has no anchor.

The Zambia Medicines and Medical Supplies Agency (ZAMMSA), the state’s medicines buyer and distributor, shows what outside pressure can do, and what it cannot. Its promise is plain: medicines bought for clinics reach clinics. In May 2025 the United States cut US\$50 million a year of medicines aid, citing systematic theft since 2021 and a forensic audit that, more than six months in, had not been published.²⁹ The audit’s findings reached the press two months later.³⁰ In October 2026, after audits found procurement at inflated prices, unaccounted-for stock, missing system records and medicines diverted from public health facilities, the government separated all 150 staff of ZAMMSA and said they would receive their dues in accordance with the law, the Employment Code that binds it as it binds any private employer.^{31,32} For years before any of this, the patients bore the cost of the broken promise. Seventeen months passed between the outside cut and the separation, and the timing alone does not show what caused it. Changing the people resets the step. It does not make the next team’s promise bind.

One grid, two kinds of bond

In the 2024 drought, one grid, ZESCO's, kept two promises differently. The mines were largely protected and imported power; households and small businesses absorbed load-shedding of up to twenty hours a day, for months.³³ A mine's lost output shows in next month's export figures. A small firm's shows nowhere.

When the cash ran out in 2020, the state defaulted on its dollar bonds and kept every kwacha bond and bill paid.³⁴ The kwacha paper is held mostly by the country's own banks and pension funds; the Treasury's stated reason for keeping it out of the restructuring was "to preserve financial stability and ensure a well-functioning domestic debt market".³⁵ Two different things happened at once. The default itself is the plainest case where cash beat cost: four years outside the market was a known price, and it was paid. Within the shortage, the order held: of the two promises, the one whose breaking would cost most at home was the one kept. The dollar bonds have been paid on schedule since the 2024 exchange.³⁶

5. Who pays

The creditor carries the wait, and the Treasury saves on it

K84.1bn of verified domestic arrears is

Figure	K bn	Comparison
Verified domestic arrears, August 2025	84.1	
Total spending, 2026 budget	253.1	84.1 / 253.1 = 33 percent
Health, 2026 budget	26.2	84.1 / 26.2 = 3.2 years

Each block is K1 billion, with the K84.1 billion in evergreen. The budget total and the health allocation are from the 2026 Budget Address (K253.1 billion, 27.4 percent of GDP; K26.2 billion, 10.3 percent of the budget); the comparison is this page's arithmetic.²³

When a promise breaks, somebody carries it. Verified domestic arrears stood at K84.1 billion at the end of August 2025 on the 2026 budget speech, up K3.3 billion from December 2024; how that figure sits beside the Treasury's own K88.7 billion of March 2024 is in the numbers table.^{23,37,11} At the Treasury's own borrowing costs in October 2025, 13.9 percent on bills and 17.7 on bonds, carrying K84 billion instead of borrowing it saves about K12 billion to K15 billion a year in interest (this page's arithmetic: 84.1 times 13.9 percent is K11.7 billion).¹² That is more than twice the K5.5 billion the 2026 budget gives to clear arrears (K4.7 billion) and pay court awards (K0.81 billion).²³

The saving is on the classes with no interest clause: ordinary suppliers, refunds, staff claims. On the classes with penalty clauses the Treasury's own account shows the opposite. By the end of 2023 the fuel suppliers' interest and penalties exceeded the principal, and the bank loans that cleared them, at under 13.25 percent, were "notably lower than the penalty rates previously incurred": on those bills, waiting cost more than borrowing.¹² The saving on the rest holds while suppliers do not price the wait into their bids. Where they do, the state pays for its arrears in higher contract prices, spread thin and hidden. Either way the firm carries it first, at the 29 percent banks charge, if a bank will lend.²³ In Europe, once late-payment rules were tightened, firm exits fell most in the sectors that sell most to government.³⁸

The 2026 budget: K73.7bn for debt payments, K5.5bn for old bills and court awards

2026 budget line	K bn
Domestic debt payments, which the budget table labels interest	52.0
External debt payments	21.7
Debt payments, together	73.7
To dismantle arrears	4.7
Compensation Fund, court awards	0.81
Old bills and awards, together	5.5

About thirteen kwacha of debt payments for every kwacha of old bills and court awards, 2026 budget: $73.7 / 5.5 = 13.4$ (this page's arithmetic). Each block is one kwacha in that ratio.²³

The arrears strategy had promised at least K6.8 billion a year across all its legacy classes, roads and fuel refinancing aside.¹¹ The budget's named arrears line is K4.7 billion; whether other lines carry the rest is not shown in the speech. It was the Treasury's own target, in this page's sense of the word: no counterparty, and no stated cost for giving less. Over the 27 months of the Treasury's table, K17.7 billion of old bills were paid on the twelve domestic classes and K13.9 billion of new ones created on the same classes.¹¹ None of this needs bad intent. Nobody ranks suppliers last. Nobody has to.

18 years at K4.7bn a year

Figure	Value
Verified domestic arrears, August 2025	K84.1bn
Budget line to dismantle arrears, 2026	K4.7bn a year
Years to clear at that pace, nothing new added	17.9
Year the stock would be cleared	2044

Each segment is one year's K4.7 billion, the 2026 budget's line for dismantling arrears; $84.1 / 4.7 = 17.9$ years (this page's arithmetic). The stock grew by K3.3 billion in the eight months to August 2025, so the clock assumes what has not yet happened.²³

Winning in court does not move a creditor up. The law bars execution or attachment against the State; judgments are paid from the Compensation Fund as money allows.^{39,9} In a 2022 constitutional case over costs agreed in 2009 and still unpaid, the State told the court it had lacked the funds, and that judgment debts going back to 1999 were unpaid too. The court dismissed the petition, and urged that the Fund be given enough to clear judgment debts promptly.⁴⁰

Sometimes the bill is moved rather than carried. In 2025 the FRA borrowed against its maize to pay farmers, and the fuel arrears were cleared with a bank loan.¹² Both creditors cost the state something to keep waiting. The ordinary supplier costs it nothing, so the ordinary supplier waits.

From the mill. Yumi Milling has never been paid late by a public body, because it has never let one owe it. The two public-side buyers in its history, during the 2024 drought relief, paid in advance. To a government programme it would deliver on credit only against security. The cost of that rule is the sales it refused, and no table counts them.

6. The radius

Where no court is used, a promise reaches as far as its owner can walk

Where a small firm cannot use a court, a promise binds only as far as the firm can reach. Enforcing a contract in court took 611 days and cost 38.7 percent of the claim, on data to 2019.⁴¹ So a bank lends to a small firm against a title deed, or against a salary it can deduct at source: a promise it can execute itself. Studies of firms where courts are weak find the same. Trade credit goes to customers known through

networks, dealt with for years, or with nowhere else to buy; firms that trust the courts extend more of it.^{42,43,44}

From the mill: it supplies on credit only to established companies, and only in Southern Province and Lusaka, where it has people. One neighbour buys on a handshake. That is the radius. Credit goes where the owner can walk over, to a counterparty who will be there next season. Beyond the radius, cash. Making things means crossing the radius, because a long chain runs through strangers. Trading stays inside it.

And the radius shrinks from the top. A firm given no credit extends little; its buyers, given little, extend less. In the mill's words: "we prefer cash because we do not have access to credit, and that limits our growth." The share of registered firms with a bank loan fell from 10.1 percent in 2019 to 3.1 percent in 2025; banks paid for 0.8 percent of what firms invested.^{45,46} Lusaka and the Copperbelt took 80 percent of the loans made in 2025.⁴⁷

Lending to the state competes with lending to firms. A fifth of all bank assets sits in government paper, and the sector earned a return on equity of 30 percent in 2024.⁴⁸ At one of the largest banks, government securities out-earned all its loans in 2024, a year after loans had earned more.⁴⁹ NAPSA, the national pension scheme, holds nearly half of its K87 billion in government paper.⁵⁰ The worker's saving lends to the Treasury at 14 to 18 percent; the firm that employs the worker borrows, if at all, at 29.^{12,23} The Bank of Zambia's own research found that the more a bank lends to the government, the less it lends to everyone else.⁵¹ The arrow may run both ways, since small firms a bank cannot read are hard to price. Either way, the bank that lends to the Treasury instead of the mill has shortened every chain below the mill.

Where K100 of deposits went, end of 2025

Lent to anyone	K45
of which small firms	K5.75
of which small farms	K0.58
Lent to the government	K31
At the Bank of Zambia	K26
With banks abroad	K17

The K26 at the Bank of Zambia is mostly the 26 percent reserve it requires. The small-firm and small-farm bars apply their shares of 2025 lending (12.8 and 1.3 percent) to the year-end stock, so they are indicative (this page's arithmetic). Banks also hold capital and borrow, from the Bank of Zambia and from abroad, so their assets exceed their deposits and the bars add to more than K100. In March 2026 savers earned 7.5 percent; borrowers paid 28.6.^{52,47,53}

From the mill. Yumi Milling's turnover grew fourfold. No bank has ever offered it a facility.

7. What makers do

Fewer promises from others, and the ones that remain cost more

The makers that survive need fewer promises from others, or make the ones they rely on execute themselves. This describes survivors. It is not advice, and the mill is one specimen.

They own more steps. The mill makes, packs, delivers and sells through its own people, so each of those promises is to itself. **They make their own steps cheap.** The roles a forty-person firm never had, the accountant, the analyst, the compliance clerk, now cost electricity and an owner who can steer them. Those roles were weak steps, because the firm did without them, so fixing them gains a lot. And by the arithmetic of section 01, the stronger a firm's own steps, the more each remaining broken

promise costs it. Software widens the gap this page describes, and raises the return on closing it: a firm whose own steps are strong can see which promise from outside is costing it most.

One mill, two years. Yumi Milling built its own systems on AI: sales, stock, books, customer messages, reporting. It replaced a bought-in system that never went live. Nobody lost a job. The firm stopped buying hours from consultants and started competing with firms ten times its size. The steps it did not move are exactly the ones this page is about: when buyers pay, when the power holds.

They sell for cash, or on short fixed terms, and walk away from buyers whose promise does not bind, even when the buyer is the state and the volume is tempting. They pay their own suppliers on a fixed day, because a promise that binds is worth money to the other side: Kenyan dairy farmers accept a lower price from a buyer who can be trusted to pay monthly in a lump sum.⁵⁴ What a firm cannot move on its own is the subject of the next section.

8. What this makes possible

They exist. They can be found. Some can be fixed.

The weak links are there. This section says what they are worth, what has become cheap, and whose hands each one needs.

The country adds about 700,000 people a year on the projections of ZamStats, the statistics agency.⁵⁵ The current plan targets a million jobs over five years; the World Bank puts the need at more than ten million by 2050.^{56,57} They will probably not come mainly from factories in zones: across Africa, large modern firms have raised output without adding many jobs.⁵⁸ The jobs are probably in the middle of the chain, where the most promises have to bind.

The food system, farm to plate

Share of all jobs	51%
Share of GDP	15%

IFPRI, the food policy research institute, 2023, on its own definition of work, which counts more farming than the 2024 Labour Force Survey does.⁵⁹

The value is off the farm. The people are on it. The distance between the two is the chain. Across districts in ten African countries, places with more salaried jobs that sell beyond the district have more local jobs too: for Zambia, about 3.7 for each.⁶⁰ How many one promise made to bind would bring is not known.

The return on a point at a weak step is the value of everything behind it, so the map of weak links is also a map of returns. A decision is cheap to change; a dam is not.

What software moves

Software does not by itself create a cost for breaking a promise. But three of the four sources of that cost, visibility, self-execution and exit, are now things a small firm or a single office can build, and the first of them needs no new law. **Visibility:** the record of who kept which promise now costs little to keep, and a promise broken in public costs something without a court. **Self-execution:** interest that accrues without a claim, escrow that releases on delivery, a warehouse receipt that is the collateral. **Exit:** a firm whose record travels with it can leave a bad buyer and be trusted by the next; in one Caribbean lender’s data, phone use predicted repayment about as well as a credit bureau did.⁶¹ Software does not move a court. It does not move cash.

Software that anyone can copy is being repriced towards zero. What keeps its value is software tied to a step that did not get cheaper: power, roads, borders, a licence, a buyer who pays on a date, a record. From the mill, e-GP, the public purchasing system firms must use to sell to the state, is the hardest public system to use: a step that did not get cheaper. Across 187 countries, stricter procurement rules go with better outcomes only where public offices are weak, which is where Zambia sits, so a written rule may bind here where a better interface would not.⁶²

The opportunity is in records. AI can make records cheap to keep, readable in the languages people use, and useful to a forty-person firm.

Each of the four costs that make a promise bind is placed by someone other than the promiser: a court by the state, exit by firms that can leave, visibility by whoever measures and publishes, self-execution by whoever builds the system, which can now be one person with a laptop. No one of them can place all four, which is why the weak steps on this page sit where two owners meet. Each case below says which hands it needs.

The payment clock. What it moves. Visibility. A measurement, not a lever: a known number is harder to carry than an unknown one, and a supplier who can see it can choose. **What still binds.** Exit, and the part of the state that is measured, not the payer's conscience. Cash is not moved; that is the test's point. **Within a year.** The series exists for one payer (test 2 in section 09). **Hands.** Suppliers and whoever publishes can start without asking; the payer can veto by not confirming dates.

The warehouse receipt. What it moves. Self-execution: a receipt that is the collateral, so the lender holds the grain without knowing the farmer. The Act passed in March 2026 is not in force.⁶³ **What still binds.** It removes the bank's stated reason not to lend; it does not make it lend. And the collateral's value is set by politics in an election season: the FRA's price sets it. **Within a year.** One loan against a receipt to a borrower the lender did not know. **Hands.** One warehouse, one lender and one borrower, under the regime in force; the minister can veto by not bringing the Act into force, the FRA by buying above market.

Models that read Chitonga and Lozi. What it moves. The precondition for visibility, not a lever: a record nobody can read is visible to nobody who could act on it. Chitonga and Lozi are not in the standard text benchmark for translation models, where Bemba and Nyanja are, though a university speech corpus covers all four.^{64,65} **What still binds.** Whatever bound before: a readable record changes who sees a break, not what breaking costs. **Within a year.** A model reading Chitonga at a stated accuracy on the public corpus. **Hands.** Anyone with the corpus and compute; the holders of the records and of the corpus licence can veto.

None of this needs a committee. Each step where two owners meet needs one promiser, one creditor and one person counting, because a step that everyone owns is the step nobody pays for when it breaks. And the promiser is an office, not a sector.

The mill is the specimen of section 07. It pays its suppliers on a fixed day and keeps its own records (the box there), and the step it could not move, when a buyer pays, is the first case above.

The next section reads the World Bank's firm survey as partly a record of late payment. If firms that sell to the state name finance no more often than firms that do not, this page withdraws that reading.

The weak links are there. Some can be found with public numbers and a few hundred scored chains, and this page is a first, partial map of where effort would probably pay. Some can be strengthened without anyone's permission. Within a year we will know whether that holds for one payer, one receipt and one language, and the next version of this page will say which.

9. How this page could be wrong

The survey evidence against it, and five tests

The rule is a claim, not a finding, and the best survey evidence cuts against its emphasis. Between October 2025 and May 2026 the World Bank asked 608 registered Zambian firms to name their single biggest obstacle.⁴⁶ They named finance and power, not late payment by the state.

Access to finance	29%
Electricity	24%
Informal competitors	12%
Customs and trade rules	9%
Tax rates	9%

Percent of all firms, as the published profile rounds them; licensing and permits are not among the ten obstacles it charts. Small firms name finance more often, 33 percent. The 2019 survey gave the same first two.⁶⁶ Nine firms in ten had power cuts, 21.6 a month on average. Informal firms, the smallest firms and farms, most of the people this page is about, are outside the survey.

This page reads the finance answer as partly where other broken promises land: a firm waiting on a public payment reports a finance problem, because the survey allows one answer. That is a reinterpretation, and it can be checked. The first test: the survey asks each firm whether it secured or tried to secure a government contract, so cross that with the obstacle named. Four more tests could settle it within a year:

1. Recode the cost column of section 03 blind. Someone who has not seen the payments scores each of the thirteen creditor classes on the five tests. If the blind coding does no better than the size of the bill, the order is cash, not cost. The Treasury's own 2024 categories are a first check (section 03).
2. How many days does one public payer take, from approved invoice to money? No office publishes it. A monthly series beside the Treasury's cash balance would show whether the weak creditors wait even when cash improves: the rule predicts they do, cash alone that they do not.
3. What kills firms between their first year and their fourth: the market, the promises public bodies break, or a competitor who skips the obligations the formal firm pays for? In Choma, a small mill and a sunflower-oil press closed in the last two years. Nobody has yet asked them why.
4. How many broken public promises are the clinics' kind, which no decision could keep? If most are, the argument narrows to money.

The tool on the web page collects chains from the people who run them. It gathers hypotheses, not proof, and the people who run chains are the only ones who can name the steps. Where they blame a step they do not own, that is itself a claim worth checking.

If you have a laptop

Three projects on this page need no office, no funder and no permission. Each is a trade: what you bring, what you get, who else is at the step.

1. **A payment clock for one public payer.** You bring twenty invoices to one public payer, from the suppliers who hold them, each with its approval date and its payment date, and you publish the days between, monthly. You get a series nobody has published, under your name, and a number every supplier to that payer will want. The suppliers get a number they can price. The payer gets measured. Yumi Milling sells nothing to the state today, so the first twenty invoices to a public payer must come from someone who does.

2. **Why two firms in Choma closed.** You bring a visit to the small mill and the sunflower-oil press that closed in the last two years, and the three questions. You get two case records nobody has, and the first entries in a series on what kills firms between their first year and their fourth. The owners get asked, which nobody has done.
3. **Chitonga and Lozi data.** You bring the public university speech corpus, 22 hours of Chitonga and 6 of Lozi, and compute. You get a model that reads Chitonga at a stated accuracy, which does not exist, and the entry the standard text benchmark lacks. Every record keeper in Southern and Western Province could get a reader.

The definition, to copy. An invoice counts as approved on the day the payer's office confirms in writing that the goods or service were received and the amount is due; the payer's own stamp, goods-received note or system status is the record. It counts as paid on the day the money is in the supplier's account, not the day a cheque or instruction is issued. Approval day is day zero and the next calendar day is day one; a payment on the approval day is zero days. The month's figures are the median and the longest, the count of invoices behind them, and nothing that identifies a supplier.

Write to chris@zamai.pro and you will have an answer within 48 hours.

Appendix A. The numbers

The country, in figures with sources

Everything on this page stands on these numbers. Each is public, dated, and linked to its source.

Figure	What it is	Source
12.0m	People of working age	Labour Force Survey 2024 [67]
3.97m	Counted as employed; 1.18 million of them, 30 percent, worked in registered firms and institutions, the formal sector (this page's arithmetic on the survey's counts). On the survey's own measure of the job rather than the firm, 74.2 percent were informally employed; the two are different concepts	LFS 2024 [67]
7.4m	Of working age but outside the labour force. Most farm for their own consumption, which the statistics no longer count as employment	LFS 2024 [67]
~700k	People added every year: 23.0 million in 2026, 23.7 million in 2027, medium projection	ZamStats projections 2023 to 2047 [55]
51%	Of all jobs are in the food system, farm to plate, on IFPRI's definition of work; it makes 15 percent of GDP	IFPRI 2023 [59]
12.5%	Bank credit to the private sector, as a share of GDP	World Bank, 2024 [68]
K45	Of every K100 deposited, lent to anyone at all at the end of 2025; K31 in government paper, K26 at the Bank of Zambia (mostly the 26 percent reserve requirement), K17 with banks abroad	Bank of Zambia, 2026 [52]
12.8%	Of credit disbursed in 2025 went to small and medium firms; 1.3 percent to small farms	BoZ credit-market data, Q1 2026 [47]
3.1%	Of registered firms with a bank loan or credit line in 2025, down from 10.1 percent in 2019; banks paid for 0.8 percent of their investment	Enterprise Survey 2025 [46]
46%	Of NAPSA's K87 billion is lent to the government	NAPSA, end-2024 [50]
K84.1bn	Verified domestic arrears at the end of August 2025, up K3.3bn from December 2024 on the budget speech; K77.5bn at the end of September 2024 on the minister's March 2025 statement. The speech's label is payments to suppliers of goods and services; the Treasury's own table at March 2024 counts tax refunds, pensions, staff claims, court awards, fuel, roads and power producers under domestic arrears, K88.7bn in all	2026 Budget Address [23]; Finance Minister, March 2025 [37]; Treasury, 2024 [11]
1% / 100%	Share of what was owed at the end of 2021 that was paid by March 2024: road contractors 1.1 percent, farmers 100, ordinary suppliers 32, power producers 36. Shares are this page's arithmetic on the Treasury's table. Over the same 27 months K17.7bn of old bills were paid on the twelve domestic classes and K13.9bn of new ones created; beside that, K12.2bn fell due to contractors when foreign project loans were cancelled, K13.3bn of late-payment interest was added to the fuel bill, and K19.0bn of the power producers' claim was negotiated away	Treasury arrears strategy, 2024 [11]
13.4 : 1	Debt payments (K73.7bn: K52.0bn domestic, which the budget table labels interest, and K21.7bn external) against K4.7bn to clear arrears plus K0.81bn for the Compensation Fund, in the 2026 budget; this page's arithmetic	2026 Budget Address [23]
about 18 years	To clear K84.1bn of arrears at the K4.7bn a year the 2026 budget sets aside, if nothing new were added ($84.1 / 4.7 = 17.9$; this page's arithmetic)	2026 Budget Address [23]
K3.18bn	Interest one large bank earned from government securities in 2024, against K2.55bn from all its loans; in 2023 loans still earned more	Zanaco, audited note 4 [49]
K71.3bn	Tax debt owed to ZRA at the end of 2025; 82 percent of it by private businesses; the collectable share is not published	ZRA, September 2026 [14]
K13.7bn	VAT refunds approved and unpaid at the end of August 2026; in 2024, 87 percent of the refund stock was owed to mines	ZRA, September 2026 [69]
611 days	To enforce a commercial contract through the Lusaka magistrates' court, at 38.7 percent of the claim, on data to 2019; nothing comparable has been published since	World Bank, Doing Business 2020 [41]
3.1 Mt	Maize held by the FRA on 18 September 2026 (1.7 Mt bought since May, 1.4 Mt carried over); by the close of buying on 30 September, over 2 Mt bought, so about 3.4 Mt with the carry-over. Against 1.83 Mt in the 375 listed storage facilities	Lusaka Times, 18 Sep 2026 [70]; News Diggers, 30 Sep 2026 [17]; News Diggers, May 2026 [71]

Figure	What it is	Source
	–⅓ Electricity supply in 2024, cut by drought; load-shedding up to twenty hours a day for months. The mines were largely protected and imported power; households and small businesses absorbed the cuts	World Bank, 2026 [33]

One figure is older than it looks: the entrepreneurship survey in section 01 dates from 2013, and the text says so.

Appendix B. The theory

The papers and the models behind the argument

For readers who want the history and the maths. Each paper is one card: what the original work did, its model in the simplest form that keeps the point, and what it means here. Where a calculation is this page's own rather than the paper's, it is marked own illustration.

A weak link, in the language of the models (This page's own)

Five quantities are enough to write the argument down.

- V is what the chain would be worth if every step were perfect.
- q_j is the share of value that step j keeps, between 0 and 1. A step at 90 percent has $q = 0.9$.
- Y is what the chain actually delivers: V times every q multiplied together. Eight steps at 0.9 give $Y = 0.43 V$, the number at the top of the page.
- e is the effort the owner of one step, step i , puts into it, and $c(e)$ is what the effort costs the owner. More effort raises q_i ; $q_i'(e)$ is how much a little more effort raises it.
- s is the share of the chain's gain that the owner of the step feels: what breaking its promise costs it. A firm that owns the whole chain has $s = 1$. A public office whose budget does not move when the chain loses has s close to 0.

$$Y = V \cdot q_1 \cdot q_2 \cdot \dots \cdot q_n$$

Raise q_i by one point and Y rises by Y/q_i , which is V times all the *other* q s: the value of the rest of the chain. It does not depend on q_i itself. For the weakest step, the rest of the chain is the strongest set, so a point there is worth most. That is the whole case for fixing the weakest step first, and it holds only if a point of improvement costs the same at every step. In proportional terms a 10 percent gain is worth the same 10 percent anywhere. The owner sees only the share s of the gain, adds effort while that exceeds the extra cost, and stops where the two are equal:

$$s \cdot (Y / q_i) \cdot q_i'(e) = c'(e)$$

- **Lower s toward zero** and the left side vanishes. The owner stops adding effort however large the chain's loss. This is the broken promise: the cost of breaking it falls on the chain, not on the promiser.
- **Raise s** , by interest that accrues on a late payment, a published clock or a right of offset, and the owner adds effort until the equation balances at a higher q_i .
- **Make the rest of the chain stronger** (raise Y/q_i) and the same broken promise costs the chain more. A firm that makes its own steps strong, with software or anything else, feels a late payer more, not less (section 07).

- **Make the fix cheap** (small c') and even a small s moves the step. A payment that is approved but not released is a decision, and decisions are cheap. A dam is not.
- **Make the fix money the owner does not have** and no value of s moves it. This is the clinics in section 02.
- **Add the Treasury's cash.** It owes creditors 1 to m , and breaking promise j costs it s_j . With cash C below what is owed, it pays in descending order of s_j until C runs out. Raise s for one creditor without raising C and the arrears move to the next creditor down; they do not shrink. That is the ordering rule of section 02, and it is why the test in section 03 is about the order, not the total.

The three questions read off the equation. *Which step holds the chain back*: the one where a point is worth most, Y/q_i large. *Who owns it*: whose effort e moves q_i . *Who pays when it fails*: if s is near zero, the chain does. The qualifier, *could it be kept at all*: c' small. "In proportion" in the rule is shorthand: the model says effort rises with s , not that it rises in exact proportion.

The pairs in section 04 are each a change in s with the creditor held fixed. The Treasury's table in section 03 is s coded creditor by creditor, and the misses are reported there.

How the table was tested (This page's own)

Section 03 sets three orderings against the share of the end-2021 stock that each creditor class was paid by March 2024, and measures each fit as a Spearman rank correlation, average ranks for ties, on the thirteen classes with a share (the contractors on cancelled loans had no end-2021 stock). **Size of bill against share paid**: about minus 0.66; the larger the bill, the smaller the share. **This page's coding**, the count of the five tests a class scores on, against share paid: plus 0.24, or plus 0.59 if the penalty test is ignored. **The Treasury's own category**, 1 to 5 in its Table 2.0, against share paid on the eleven classes it sorted: minus 0.80, the first category paid most.¹¹ Seven of the thirteen classes received between K1.6 billion and K3.5 billion whatever they were owed. The coding was written after the shares were known; the categories were written in August 2024, after the payments but by the Treasury, which is why they are the nearer thing to a blind test.

Commitment and enforcement: why some promises bind (North and Weingast, 1989 · McMillan and Woodruff, 1999 · Johnson, McMillan and Woodruff, 2002 · Fafchamps, 2004 · Macchiavello and Morjaria, 2015)

Douglass North and Barry Weingast traced how, after 1688, the English Crown's promises to its lenders became believable: Parliament and independent courts could now make breaking them costly to the Crown, and the state's ability to borrow rose.⁴ A sovereign's promise binds when something outside the sovereign can make it pay for breaking it.

Below the state, where courts are little used, firms enforce promises themselves. In Vietnam, John McMillan and Christopher Woodruff found that firms gave more trade credit to customers who would find it hard to buy elsewhere, who were found through business networks, and who had dealt with them longer.⁴² With Simon Johnson they found, in five post-communist countries, that firms which believed the courts worked gave more trade credit and were more willing to try new suppliers.⁴³ Marcel Fafchamps documented the same reliance on relationships and networks among African traders and manufacturers.⁴⁴ Rocco Macchiavello and Ameet Morjaria measured the value of a relationship among Kenyan rose exporters: it grew with the relationship's age, and under a supply shock in 2008 exporters protected deliveries to the buyers whose relationships were worth most to them.⁵

What it means here. The rule on this page is this literature's rule, applied to the state as a promiser and read off its own payment record. The radius in section 06 is McMillan and Woodruff's finding in

Zambian clothes. Hallward-Driemeier and Pritchett's "deals versus rules" gives the state's side: where rules are not enforced, what a firm can count on is the deal it can reach.⁷²

The O-ring: why steps depend on each other (Kremer, 1993 · Hirschman, 1958)

Michael Kremer published "The O-Ring Theory of Economic Development" in 1993; in 2019 he shared the Nobel prize for experimental work on poverty. A product needs n tasks. Each is done at a quality q_i , the probability that the task comes out right. The expected output of a firm is

$$E(y) = k^a \cdot n \cdot B \cdot \prod_{i=1}^n q_i$$

where k is capital per worker and B is output per worker when every task is done perfectly. Kremer's content is complementarity: because the tasks multiply, the payoff to quality at one task rises with quality at the others. Strong sorts with strong and weak with weak, and the best firms pay most for good partners. This page also reads q as the share of value a step keeps, which turns the same formula into ordinary friction; that reading compounds losses, and compounded losses are smaller than added ones.¹

The gain from fixing one step, own illustration: raise step i from q_i to perfect and output rises by

$$\Delta Y = Y \cdot (1 / q_i - 1)$$

Fix a step working at 50 percent and the chain doubles. Fix one working at 90 percent and it gains 11 percent. The first fix is also five times as many points, so the comparison is fair only where a point costs the same at both steps.

What it means here. The loss from a weak link is largest for the firm whose other steps are strong. So a well-run firm that depends on a weak local step routes around it: it imports the input, sells abroad, or stays small. Albert Hirschman argued in 1958 that a poor country should invest where the pressure is, at the points of densest linkage, so that shortages there induce the next investment.⁷³ Hirschman saw the pressure point; Kremer and Goldratt give two different formal accounts of why it matters. Hirschman wanted deliberate imbalance; Kremer's logic points towards matched quality.

The bottleneck: fix the slowest step first (Goldratt, 1984)

Eliyahu Goldratt, a physicist turned management thinker, wrote *The Goal* as a novel: a plant manager notices on a scout hike that the troop moves only as fast as its slowest boy, and that hurrying everyone else just stretches the line.⁷⁴ The throughput of a line is the capacity of its slowest step:

$$T = \min (c_1, c_2, \dots, c_n)$$

His five focusing steps: find the constraint; get the most out of it; make everything else serve it; raise its capacity; when it moves, start again. Under *min*, improving any step other than the constraint adds nothing, so fixing the weakest step first is unconditional. Under Kremer's product it holds only if a point of improvement costs about the same everywhere.

What it means here. This is the method half of the framework. The three questions do Goldratt's first step for a whole chain at once, and add one he did not need inside one factory: who owns the step, and who pays when it fails.

Intermediate goods: how small frictions become large gaps (Jones, 2011 · Hsieh and Klenow, 2009)

Income per person in the richest countries is more than fifty times that in the poorest, and measured differences in capital and schooling explain only part of it. Charles Jones looked for the rest in the web of firms that use each other's products as inputs.² Output uses capital K , labour L and intermediate goods X , which take a share σ of costs:

$$Y = A \cdot (K^a L^{1-a})^{1-\sigma} \cdot X^\sigma$$

If the intermediates are themselves made from output, Y appears on both sides, and solving gives $Y \propto A^{1/(1-\sigma)}$. The exponent is the intermediate-goods multiplier. With σ around one half, it is 2: a country with half the productivity at every step ends up with a quarter of the output. Make the inputs hard to substitute for one another, the O-ring again, and the multiplier grows further.

Hsieh and Klenow measured a cousin of this, misallocation: moving capital and labour to where they are most productive, with no new technology, would raise manufacturing productivity by 30 to 50 percent in China and 40 to 60 percent in India.⁷⁵

Competitive advantage: why the chain decides who wins (Ricardo, 1817 · Porter, 1985 and 1990)

Ricardo: two countries both gain by trading when each specialises in what it is relatively better at, even if one is better at everything.⁷⁶ Porter: a firm's cost is the cost of the whole value system it sits in, and national advantage is created, not inherited, out of factor conditions, demanding home buyers, capable local suppliers and rivalry.⁷⁷ The cost of delivering one unit of value, own illustration, is the underlying cost divided by what the chain keeps, so against a competitor whose steps keep q_i^* the cost gap is

$$c / c^* = \prod_i (q_i^* / q_i)$$

What it means here. Weak links sit in Porter's factor conditions, in the supporting industries (power, transport, finance, packaging) and in what government does to all four corners. Freight is one of them: it shelters the home shelf on paper and taxes every imported input and every export.

The state and business: who is embedded, who is in the deal (Evans, 1995 · Khan and the political-settlements school)

Peter Evans compared the states that industrialised with those that did not. The ones that worked paired an insulated, competent bureaucracy with dense, institutionalised ties to producers: autonomy and embeddedness.⁷⁸ In Zambia that dialogue runs through chambers, unions and sector associations; a small firm that belongs to none of them has the statistical form. Mushtaq Khan and the political-settlements school add why institutions work for some groups and not others: enforcement follows how groups are organised, not what the rule says.⁷⁹ Small firms are unorganised, not a bloc.

What it means here. In this page's terms, an organised creditor can make breaking a promise to it costly, and an unorganised one cannot. This literature says which broken promises get fixed anyway: the ones owed to creditors who are organised. It also says what would change that: a channel through which small firms' broken promises become visible.

Farm income, the rural non-farm economy, and the local multiplier (Johnston and Mellor, 1961 · Moretti, 2010 · Charpe, 2022)

Johnston and Mellor set out agriculture's five contributions to development: food, labour, savings, foreign exchange and a market for everything else.⁸⁰ Mellor's 2017 book showed, household class by household class, that small commercial farmers spend rising income on locally produced goods and services, generating the largest employment multiplier in the economy.⁸¹ Moretti measured that each tradable job in a US city goes with 1.6 local non-tradable jobs; Charpe repeated the exercise across 1,441 administrative units in ten African countries.^{82,60} Zambia: 3.68. Rwanda 4.62, Tanzania 3.75, Ghana 1.61, South Africa 0.53. The spread is wide, and these are associations across places, not the effect of one change.

jobs per constraint relieved = livelihoods in the chain $\times$ linkage density $\times$ labour intensity $\times$ local multiplier

Every term points at the same chain: smallholder grain and legumes, aggregation, storage and transport, processing, local demand.

Automation: why making tasks free does less than it seems (Baumol, 1967 · Aghion, Jones and Jones, 2019 · Jones, 2026)

Baumol observed that a string quartet needs as many players as it did two centuries ago; sectors whose productivity cannot rise take a growing share of spending.⁸³ Aghion, Jones and Jones applied the idea to AI, and Charles Jones returned to it in 2026: when tasks are complements, output is held back by the tasks that have not been automated.^{84,85} Output combines n tasks with an elasticity of substitution ε below one. Make a share β of them infinitely productive and output rises by a finite factor, own illustration:

$$Y_{\text{new}} / Y_{\text{old}} = (1 - \beta)^{-\varepsilon/(1-\varepsilon)}$$

With $\varepsilon = 0.5$, automating half of all tasks, for free, doubles output, if the freed workers do nothing else. Moved to the remaining tasks, they raise it further.

Acemoglu and Restrepo treat jobs as bundles of tasks: automation removes some and creates new ones.⁸⁶ Paul David showed that electricity took about four decades to show up in productivity figures, because factories had to be rebuilt around it.⁸⁷ The complements arrived slowly. Here the complements are the weak links.

AI and development: what the experiments say (Korinek and Stiglitz, 2021 · Acemoglu, 2025 · Otis and others, 2026)

Korinek and Stiglitz: AI is labour-saving and winner-takes-all, and erodes the labour-cost advantage that late developers relied on.⁸⁸ Acemoglu, applying task-level exposure to the arithmetic of growth, finds a US productivity gain of at most 0.7 percent over ten years; for a country whose exposed share is a fraction of the US's, the direct channel is smaller still.⁸⁹ Brynjolfsson's productivity J-curve: general-purpose technologies need complementary investment that accounts miss, so measured gains lag by years.⁹⁰

Otis and colleagues gave 640 Kenyan entrepreneurs a GPT-4 mentor for five months: null on average, about +15 percent for strong performers, about -8 for weak ones.⁹¹ Humlum and Vestergaard, with Danish administrative data on 25,000 workers: two years after chatbot adoption, precise zeros on earnings and hours.⁹² What moved, measurably, in Africa: six weeks of supervised AI tutoring in Nigeria, +0.3 standard deviations; AI decision support behind clinicians in Kenya across 40,000 visits, diagnostic errors down 16 percent; a geospatial database for Ghanaian tax collectors, collections up 103 percent.^{93,94,95} All three augmented a named person.

What it means here. AI is a strong-link technology: it raises the steps that were already near the frontier and can lower those that were not. The World Bank's 2026 report frames AI's payoff as "complements", power, connectivity, education, institutions, local data, which is this page's chain in the Bank's words.⁹⁶

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Appendix C. Version history

Section numbers in each entry refer to the version it describes.

- v6.1, 4 October 2026. The case for the opportunity, after a discussion among four readers (an editor, a theory-of-change reader, a narrative editor and a young Zambian reader) and the author's decisions. The headline gains its second sentence; the first screen and the abstract carry the opportunity in the page's own arithmetic. A new section 08, What this makes possible, takes the stakes and "What software moves" from the old 07 and 08 and sets out three cases, the payment clock, the warehouse receipt and models that read Chitonga and Lozi, each with what it moves, what still binds, the first signal within a year and whose hands it needs, with a disconfirming line; the tests become section 09, with a fourth door for anyone with a laptop and a definition of approved and paid to copy. Public bodies are now named in the text by the acronyms in use (FRA, NHIMA, ZESCO, ZAMMSA, ZRA, NAPSA, Bank of Zambia), the function given once; persons stay unnamed. Cuts, so that this version is shorter than v6: the correlation

paragraphs of section 03 compressed to one, with the arithmetic moved to a theory card; the IMF paragraph and the second grain paragraph shortened; the Employment Code and award sentences removed from the medicines case; the arrears reconciliation moved to the numbers table; the compounding sentence, the Otis line and two mill lines on banks cut. Six figures added to the page and the PDF: the Treasury's table as bars, two seasons on one clock, the arrears against the budget, thirteen to one, eighteen years, three steps against ten. Sections renumbered: 01 to 09 the argument, 10 numbers, 11 theory, 12 the tool, 13 sources. Seams closed after a flow read.

- v6, 4 October 2026. Rewritten as one argument around the three questions, after adversarial reviews by three readers: a development economist, a policy reader and a structural editor. The rule now stands on the first screen, with its form under a cash shortage: the state pays in the order of what breaking each promise costs it. One list of what makes a promise bind (exit, a court, visibility, self-execution). The Treasury's payment table is shown with all fourteen of its creditor classes (its three utility rows merged), the kwacha paid, a cost column coded on stated tests, and the Treasury's own 2024 sorting of each class into five numbered categories with a clearance horizon; the result is reported as it came out: the size of the bill fits the table better than this page's coding, and the Treasury's own order fits best, though it was written after the payments. A new section sets the same creditor against a different cost: the farmers in two seasons, salaries and allowances, the IMF's criterion and its target, the medicines supply agency, the grid in the drought, the two kinds of bond. Who pays is rebuilt around the Treasury's saving, the budget, the Compensation Fund and the law that bars execution against the State. The literature on commitment and enforcement is added. Corrections: Barrot and Nanda's crowding out stated, and the 75,000 jobs figure dropped because it could not be confirmed; Bosio and others' result stated as published; compounding stated honestly and "fix the weakest first" made conditional; the motive lines in the old "who gains" section removed; the 2013 survey dated where it appears; the deposit figure's small-firm bars aligned with the numbers table. The lede and section 00 cut. Sections renumbered: 01 to 08 the argument, 09 the numbers, 10 the theory, 11 the tool, now at the end as a proof of concept, with two example chains added (an importer and a local processor, with illustrative scores), 12 sources and changes. Corrections after a fourth adversarial review, 3 October, evening: the power producers and the contractors on cancelled loans restored to the Treasury table and the correlations recomputed; new arrears stated like for like (K13.9 billion on the twelve domestic classes, not the K26.1 billion grand total); the Treasury's principles quoted in its words; the Fund's criterion and target stated as the report defines them, with the four test dates it reports; the Fund's published sentence on election-cycle prices and the agency's three-day payment promise added beside the author's observation; the salary record attributed to the minister; the K84.1 billion dated as the speech states it; the interest saving confined to the classes without penalty clauses; 13.4 to 1 and the 30 percent formal-sector share corrected; two citations removed that did not say what the text said; the successor-programme talks sourced; the importer and processor example chains built with the same steps.
- v5.4, 3 October 2026. Corrections after an adversarial review by three readers: the grain programme proposes a review of the agency's mandate rather than setting it; storage is the listed facilities, not the whole country; the K5 billion was the agency's bank facility; farmers were paid by 28 August, around the vote; the IMF programme ended in January 2026; K84.1bn is all verified domestic arrears; the landlocked point corrected; the medicines passage and the Employment Code stated accurately.
- v5.3 correction, 3 October 2026: Bemba and Nyanja are in the standard AI tests; Tonga and Lozi are not (the earlier line said none of the four were). Logged here in v5.3; the text was corrected in

v5.4.

- v5.3, 3 October 2026. The grain agency's 2026 season against its mandate, budget and storage, and who paid in 2025 (section 03); the medicines supply agency, the foreign aid cut and the separation of all staff (section 09).
- v5.2, 3 October 2026. The government's own programme on the grain agency's mandate added beside its 2026 purchases (section 03; an earlier version of this entry said section 07).
- v5.1, 3 October 2026. The World Bank's 2025 Enterprise Survey replaces the 2019 one (608 firms, October 2025 to May 2026); bank lending to firms added: 3.1 percent of firms with a loan, down from 10.1 percent in 2019.
- v5, 2 October 2026. Rebuilt around one rule, a promise binds in proportion to what it costs to break it: the state's record by creditor, the Treasury's own payment order, who gains, the radius; four open questions; eleven sources added.
- v4, 2 October 2026. Rewritten as one argument in nine claims, from the trader to the end of the chain; observation only, no prescriptions; the software argument made explicit; appendix unchanged. Section 00, The space, was added during v4 without an entry of its own.
- v3, 30 September 2026. Rebuilt after review: shorter, one section on the idea, bank figures updated to end-2025, agencies described by function, the tool in two passes, sources numbered.
- v2, 29 September 2026. Competitiveness, the informal sector, capital, the state, jobs and AI added; theory section with calculators.
- v1, 28 September 2026. The idea, the method, six chains, the tool.