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Local Multipliers, Aggregate Effects, and External Adjustment**

Arthur Mendes
World Bank

Wataru Miyamoto
University of Hong Kong

Thuy Lan Nguyen
Federal Reserve Bank of San Francisco

Steven Pennings
World Bank

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Cash Transfers in Developing Countries: Local Multipliers, Aggregate Effects, and External Adjustment*

Arthur Mendes^a, Wataru Miyamoto^b, Thuy Lan Nguyen^c, Steven Pennings^a

^a *World Bank*

^b *University of Hong Kong*

^c *Federal Reserve Bank of San Francisco*

Abstract

This paper studies the local and aggregate effects of cash transfers in developing countries, and how both change as the cash transfer program scales up. We build a two-region New Keynesian small open economy model and calibrate it to rich pre-treatment microdata from an ongoing cash transfer experiment in Malawi. The model implies a local multiplier on temporary transfers of about one, which depends on price stickiness, the share of liquidity-constrained households, and home bias in consumption. Spillovers to the rest of the country are negative under Malawi's restricted international capital mobility and parallel exchange rate regimes, as cash transfers appreciate the real exchange rate and reduce exports. Consequently, the aggregate multiplier is less than the local multiplier. As the program scales up, the local multiplier converges toward the aggregate multiplier, so a scaled-up program may have smaller multipliers than micro-level estimates suggest. However, with unrestricted capital mobility, spillovers can be positive, especially under a fixed exchange rate. These results highlight the importance of the macroeconomic policy environment for aggregate multipliers and the effects of scaled-up transfer programs.

Keywords: cash transfers, randomized controlled trials, local multiplier, developing countries, capital account openness, exchange rate regime

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Email addresses: agalegomendes@worldbank.org (Arthur Mendes), wataru.miyamoto1@gmail.com (Wataru Miyamoto), thuylan.nguyen00@gmail.com (Thuy Lan Nguyen), spennings@worldbank.org (Steven Pennings)

1. Introduction

Cash transfers are a key policy tool to reduce poverty and provide economic stimulus, and have been increasing in scale and popularity. For example, GiveDirectly, an international non-governmental organization, has provided large temporary cash transfers, typically close to 100% of per capita GDP, to more than 1.5 million poor people in treated regions of developing countries and plans to expand. As these programs scale up, it is important to understand their macroeconomic effects, both in treated regions receiving the transfer and through spillovers to the national economy via general equilibrium mechanisms.

Although there is a large empirical literature on the micro effects of cash transfers through randomized controlled trials (RCTs) at the individual level, much less is known about their macroeconomic impacts. One exception is the RCT studied by [Egger et al. \(2022\)](#), who estimate a large positive impact of GiveDirectly cash transfers on local GDP in Kenya. However, local RCT estimates do not directly reveal how local effects translate into aggregate effects, or how these effects change as programs scale up. When the treated region is geographically small, aggregate variables such as the exchange rate and interest rates are largely unaffected. As the program expands, the general equilibrium effects operating through these aggregate variables become increasingly important and may depend on the broader macroeconomic environment, including capital mobility and the exchange rate regime. Thus, RCTs alone cannot determine the aggregate effects of scaled-up cash transfer programs or even the direction of spillovers to untreated regions.

In theory, the macroeconomic effects of cash transfers depend on how households spend the transfers and how the economy adjusts in general equilibrium. If transfers are spent on locally produced goods and prices are sticky, they can have large positive effects on local output. In contrast, if transfers are largely saved, spent on imported goods, or absorbed by higher prices, their effects on local output may be small. Moreover, as externally-funded transfers scale up, external adjustment through the exchange rate and international capital flows is likely to become more important.

This paper uses a dynamic stochastic general equilibrium (DSGE) model, calibrated to Malawi, to investigate the short-run macroeconomic effects of temporary cash transfers in developing countries and how these effects change as programs scale up. We focus on the impact multiplier, defined as the change in real GDP per unit of real transfer in the first year, for both the local (treated-region) response and the aggregate (national) response. First, we characterize the determinants of the local effects of cash transfers. Second, we analyze the aggregate multiplier at the national

level, which combines the local response with spillovers to the rest of the economy, and show how the macroeconomic policy environment, particularly the exchange rate regime and capital mobility, shapes the aggregate multiplier. Finally, we simulate how both multipliers change as the transfer program scales up from a small treated region to the national level.

More specifically, our model is a two-region New Keynesian small open economy model augmented with a rest-of-the-world (ROW) block that pays a cash transfer to residents of the treated region. Besides nominal rigidities, our model incorporates key features of developing economies at the household and macro levels. At the household level, the model includes two types of households, one of which is liquidity-constrained and consumes all of its income each period in a hand-to-mouth fashion. At the macro level, our model includes exchange rate controls and a debt-elastic interest rate wedge that restricts international capital flows ([Schmitt-Grohé and Uribe \(2003\)](#) and [García-Cicco et al. \(2010\)](#)). To capture Malawi’s large parallel exchange rate premium, around 150% above the official rate as of late 2025, we enrich the model to feature a parallel exchange rate. We model this as an implicit tax on foreign-currency inflows, whereby exporters and GiveDirectly receive the less favorable official exchange rate when converting US dollars into Malawian Kwacha. We note that depending on parameter choices, our framework nests a neoclassical benchmark (flexible prices and no hand-to-mouth households), a Keynesian one (sticky prices and hand-to-mouth households), and a range of macroeconomic policy environments spanning from restricted to unrestricted capital mobility and fixed to flexible exchange rates.

We discipline the model’s parameters by exploiting rich microdata from an ongoing RCT in Malawi. The detailed data from surveys of households and enterprises allow us to measure the degree of home bias in consumption and the share of hand-to-mouth households, and provide information on the degree of price stickiness. We then consider a temporary transfer that captures the ongoing large one-time cash transfer from GiveDirectly to households in the Chiradzulu district of Malawi.

Our first main finding is that the local output multiplier in the baseline calibration is 1.08, i.e. if a treated region receives US\$1 more in real cash transfers, its real output increases by about US\$1.08 in the first year. Our analysis suggests that the local multiplier depends crucially on the fraction of hand-to-mouth households, the degree of price stickiness, the strength of home bias in consumption in the treated region. These parameters determine the strength of the local demand channel. In Malawi, our calibration suggests that around 95% of the households in the treated region are hand-to-mouth, prices adjust little to changes in demand, and around 57% of consumption is

sourced locally (the rest is imported or sourced from the rest of Malawi). Our local multiplier of close to one is smaller than the 2.58 estimated by [Egger et al. \(2022\)](#) in Kenya, despite a calibration favorable to Keynesian mechanisms. Our model cannot generate a local output multiplier close to 2.5 without a consumption home bias parameter of around 0.75, which is difficult to support using Malawian microdata. As the treated region is small, such as a village or district accounting for less than 1% of Malawi’s GDP, open economy features such as the exchange rate regime and capital mobility do not affect the size of the local multiplier.

Our second main result is that the aggregate cash transfer multiplier in Malawi is *lower* than the local multiplier and a scaled-up transfer program has smaller aggregate and local impacts than village-level estimates suggest. Specifically, the aggregate multiplier is 0.72, i.e. real national output increases by \$0.72 for each \$1 of real transfers to the treated region. This is smaller than the local multiplier of 1.08, implying that a \$1 transfer *reduces* output in the control region by \$0.35. There are two opposing mechanisms affecting the size of the spillovers to the rest of Malawi (the control region). First, transfers raise demand for the control region’s tradable goods, creating a positive spillover. Second, the foreign currency inflow can appreciate the real exchange rate and reduce net exports, creating a negative spillover. This second channel is sensitive to the exchange rate regime and capital mobility. Under our baseline calibration for Malawi with severely restricted capital mobility, the real exchange rate appreciates substantially, causing the negative spillover mechanism to dominate. With the parallel exchange rate regime, the foreign exchange inflow from transfers reduces the parallel exchange rate premium, lowering the implicit tax on exporters and attenuating the fall in exports. However, this effect only partially offsets the negative spillovers, leaving the aggregate multiplier lower than the local multiplier.

As the program scales up and the treated region becomes larger, the local effects of transfers become increasingly sensitive to the macroeconomic policy environment. As the program approaches the national scale, the local multiplier converges toward the aggregate multiplier. Moreover, assuming that poorer regions are prioritized for transfers, we find that the aggregate multiplier falls as the program scales up. The reason is that scaling up reduces the share of liquidity-constrained households in the treated region, making transfers less targeted toward these households, which in turn reduces the aggregate multiplier. Together, these mechanisms lead to a substantial fall in both the local and aggregate multipliers in Malawi. For example, if the program were scaled up to treat 15% of the population, the local multiplier would fall to 0.86 and the aggregate multiplier to 0.40. Our counterfactual also demonstrates that local multipliers measured in an RCT may

overstate the short-run local effect of a scaled-up temporary cash transfer program in an economy with restricted capital mobility. At the same time, scaled-up cash transfers can still have sizable effects on national GDP growth, because the transfers themselves are large relative to GDP. For example, in Malawi, our model suggests that scaling up the ongoing cash transfer program to 10% of GDP could boost national GDP growth by about 4 percentage points.

Since the restricted capital mobility and the parallel exchange rate are specific to Malawi’s context, we extend our analysis to study how our results change across macro-policy environments. We find that when households have access to international borrowing and saving, as in an economy like Kenya, spillovers are positive and the aggregate multiplier is larger than the local multiplier. Intuitively, for a temporary transfer, the real exchange rate appreciation is smaller under unrestricted than under restricted capital mobility, so exports fall by less, and the positive demand spillover effect dominates. If the nominal exchange rate is fixed, the real appreciation is even smaller, raising the aggregate multiplier. Thus, in these macroeconomic environments, scaling up transfer programs can have substantially larger positive effects on the aggregate economy than in Malawi.

Related literature. Our paper contributes to a small but growing literature on the macroeconomic impacts of cash transfers in developing countries. Several recent papers estimate the short-run effects of cash transfers on the local economy in developing countries, usually finding a local transfer multiplier substantially above one (e.g., [Egger et al. \(2022\)](#), [Gerard et al. \(2021\)](#), and [Mendes et al. \(2026\)](#)).¹ Unlike these empirical papers, we simulate the local and aggregate multipliers in a general equilibrium model.

Second, our model-based analysis of cash transfers is complementary to two other papers in this issue, [Kim and VanVuren \(2026\)](#) and [Buera et al. \(2026\)](#), both of which study the same GiveDirectly RCT in Malawi but from different theoretical starting points. [Kim and VanVuren \(2026\)](#) model local cash transfer multipliers using an alternative slack-based mechanism where prices are flexible. They also predict a local cash transfer multiplier similar to ours: slightly above one with little inflation. However, in their paper, output rather than prices rise because marginal costs are constant due to spare capacity, whereas in our paper, price increases are constrained by

¹There is a larger literature that uses cross-sectional variation across US states and municipalities to estimate the local effects of government spending and transfers, including [Chodorow-Reich et al. \(2012\)](#); [Nakamura and Steinsson \(2014\)](#); [Pennings \(2021\)](#). Our paper also relates to a large empirical literature estimating the macroeconomic impact of fiscal policies in the aggregate time series for advanced countries ([Ramey \(2019\)](#), [Auerbach and Gorodnichenko \(2016\)](#); [Ramey and Zubairy \(2018\)](#); [Miyamoto et al. \(2018\)](#)), and for developing countries ([Kraay \(2014\)](#), [Sheremirov and Spirovska \(2022\)](#) and [Bracco et al. \(2021\)](#) among others).

price stickiness and indexation. The mechanism in [Kim and VanVuren \(2026\)](#) is also related to that in [Walker et al. \(2024\)](#), which is motivated by an earlier RCT in Kenya.² [Kim and VanVuren \(2026\)](#) also distinguish between slack and openness, which can produce similar price responses, and find evidence in favor of slack. [Buera et al. \(2026\)](#) study a heterogeneous-agent model with flexible prices and financial frictions, where a transfer affects output and consumption through real forces such as relaxed working-capital constraints, occupational entry, and migration. Apart from the different mechanisms, a key difference between our paper and these two papers is that they focus on local impacts, whereas we also simulate aggregate multipliers, scale-up impacts and the role of the macroeconomic policy environment. To our knowledge, our paper is the first to study how open-economy features—including restricted international capital mobility and fixed and parallel exchange rate regimes—shape local and aggregate cash transfer multipliers as programs scale up in developing countries. When the end-line survey data become available, evidence on output, consumption, wages, and other outcomes can be used to assess the empirical importance of these different mechanisms.

We also contribute to a small literature studying the aggregate effects of foreign aid in developing countries using structural models. For example, [Berg et al. \(2010\)](#) and [Berg et al. \(2015\)](#) study how foreign aid to the government affects the aggregate economy in a New Keynesian model adapted to low-income countries. [Bangara \(2019\)](#) uses a New Keynesian model to study the implications of foreign exchange constraints for the aggregate economy in Malawi. Unlike these papers, our paper studies direct cash transfers that do not flow through the government budget and connects their local effects to their aggregate effects.

Finally, our paper contributes to the policy debate on whether foreign exchange inflows and fiscal expansions in developing countries appreciate the real exchange rate and harm competitiveness. Our mechanism is in line with the findings of [Miyamoto et al. \(2019\)](#), who document that government spending shocks tend to appreciate the real exchange rate in developing countries. However, the empirical literature on the response of the real exchange rate to fiscal policies is not settled. For example, [Jarotschkin and Kraay \(2016\)](#) find no evidence of a short-run appreciation following foreign aid disbursements.

The paper proceeds as follows. We first describe the context of Malawi to motivate our modeling choices in Section 2. In Section 3, we present the model in detail. Section 4 discusses the calibration

²[Murphy \(2017\)](#) also includes a model of slack, though in a high-income setting designed to explain spending multipliers.

of our model to Malawi. Section 5 characterizes the determinants of the local multiplier along with a quantitative prediction in our full model for Malawi. We study scaled-up transfers in Malawi in Section 6. We then extend the analysis of the aggregate multiplier to study how it varies across different macroeconomic environments, including one intended to capture an economy such as Kenya, in Section 7. Section 8 discusses extensions and robustness under alternative calibrations. Section 9 concludes.

2. The GiveDirectly RCT and Malawi’s Macroeconomic Environment

2.1. The GiveDirectly RCT

The context for our paper comes from the ongoing cash transfer RCT in the Chiradzulu district of Malawi run by the non-governmental organization *GiveDirectly*. GiveDirectly also has the ambition to reach every poor person in Malawi and to do so in other countries as well, making studying the effects of scaling up particularly relevant.³ We exploit data from the Chiradzulu baseline surveys, conducted pre-transfer, to calibrate the model.

Chiradzulu is one of Malawi’s 28 districts, with a population of about 450,000 people spread across 10 Traditional Authorities (TAs, a type of subregion). Transfer recipients receive around US\$550 per adult via mobile money: a small US\$50 test payment followed by a US\$500 main transfer. The transfer per recipient is large: approximately equal to 100% of Malawi’s annual GDP per capita. The total transfer amount is a modest 0.5% of the national economy—similar in size to Brazil’s Bolsa Familia—but is large relative to the economy of the treated area. The total amount of transfers corresponds to roughly 30% of GDP in Chiradzulu as a whole and approximately 70% of GDP in the treated villages. The scale of the intervention is therefore much larger than in most cash transfer RCTs.⁴

We also utilize information from an earlier GiveDirectly RCT in the Khongoni subdistrict of Malawi with 70,000 recipients. The payment size was similar in Khongoni and Chiradzulu. The Khongoni study provides complementary evidence on household marginal propensities to consume and on the behavior of local prices, which we use to calibrate the hand-to-mouth share and to motivate the price-stickiness assumption.

³GiveDirectly seeks to reduce poverty by giving large unconditional cash transfers directly to poor people. It also operates outside Malawi, reaching over 1.6 million people in 15 countries.

⁴For comparison, Egger et al. (2022)’s Kenyan cash transfer RCT in Siaya county operated on a treated area of similar size to Chiradzulu, but transfers were more narrowly targeted, resulting in a transfer of 15% of village-level GDP in treated villages and only about 5% of county GDP.

2.2. Malawi’s Macroeconomic Context

Malawi is one of the world’s poorest countries with roughly 75% of Malawians living below the \$3-a-day PPP poverty line, and GDP per capita of around \$600 (averaged over the past three years). Nearly two-thirds of households work in agriculture, mostly rain-fed subsistence farming, with raw tobacco and other primary commodities accounting for the bulk of exports. Malawi imports most of its fuel, fertilizer and manufactured goods with a persistent structural trade deficit: over the last five years, exports and imports have averaged roughly 11% and 31% of GDP, respectively.

Five features of Malawi’s macroeconomic environment motivate our modeling choices.

Price setting behavior. First, survey evidence suggests that firms’ prices respond only weakly to local demand shocks. According to the Chiradzulu enterprise survey, only about 20% of firms report they would change their price if demand doubled or halved. In the same survey, when firms are asked *why* they expect prices to rise, over 75% cite general inflation while only 1% cite local customers getting richer. This suggests that firms perceive their pricing to be determined by aggregate inflation rather than idiosyncratic local demand. In the earlier Khongoni RCT, village prices moved almost one-for-one with aggregate prices despite a very large local transfer shock, as plotted in Appendix Figure B5. This observation is consistent with the findings of Egger et al. (2022), who also find almost no evidence of inflation in the Kenyan villages that receive cash transfers. At the same time, the weak response of prices to local demand does not imply that prices are fixed in Malawi. In the data, Malawi’s headline CPI inflation was around 30% in 2024, and annual inflation is highly persistent, with an autocorrelation near 0.8, which is roughly twice that of the United States (Appendix Figure B7). The same Chiradzulu enterprise survey also indicates that the average age of a price is only 4.4 months, implying a quarterly probability of price change of about 50%, which we use to discipline the probability of price reset in Section 4. These patterns, i.e., prices reset frequently and largely track national inflation but respond little to local demand, motivate our modeling choice. A fraction of firms reset prices optimally in each period, while a rule-of-thumb fraction resets prices based on the previous period’s national reset price and inflation. This setup corresponds to New Keynesian price setting *à la* Calvo with a large share of rule-of-thumb inflation indexers. We note that while Calvo price setting with rule-of-thumb indexation may be a stylized representation of price setting in Malawi, it captures the most important fact in our setting, supported by the evidence from the Chiradzulu enterprise survey: an increase in demand primarily increases quantities rather than prices in the short term.

Hand-to-mouth households. Second, most households in the treated region are hand-to-mouth consumers. In the Chiradzulu household surveys, almost 95% of respondents are hand-to-mouth, defined as holding less than US\$30 in liquid savings. This threshold corresponds to one-twentieth of gross national income (GNI) per capita, or a few weeks’ income.⁵ Using the same threshold for Malawi as a whole yields a national hand-to-mouth share of about 63%. The lower hand-to-mouth share for Malawi as a whole is plausible, since Chiradzulu is poorer than the rest of Malawi. A very high hand-to-mouth share is consistent with a marginal propensity to consume (MPC) of close to one from large one-time transfers in Khongoni subdistrict (Appendix Figure B6). It is also intuitive since high inflation quickly erodes the value of transfers saved as mobile money.

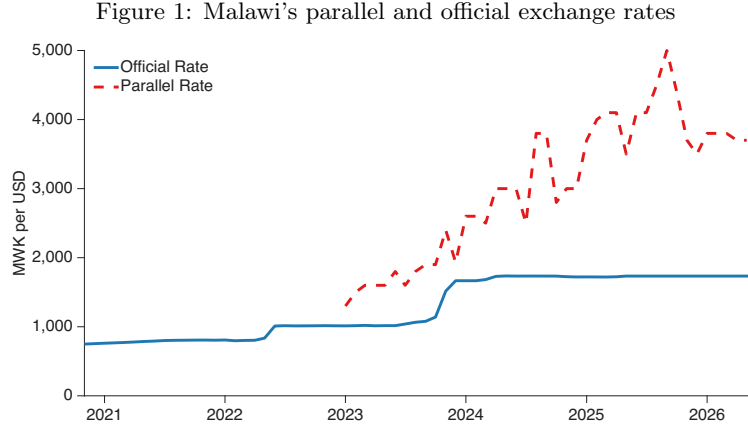
Parallel exchange rate. A third distinctive feature of Malawi’s macroeconomic environment is the large parallel exchange rate premium, one of the highest in the world. Although Malawi officially has a floating exchange rate regime with inflation targeting, in practice it has a “stabilized exchange rate regime” (IMF (2025)) where the Reserve Bank of Malawi (RBM) fixes the exchange rate below its market rate and restricts foreign exchange trading. Households, firms, and importers who cannot access foreign exchange through the official window turn to the parallel market. Exporters and GiveDirectly must purchase Malawian Kwacha (MWK) at the official rate, which effectively subjects them to a large tax. As plotted in Figure 1, in the last quarter of 2025, the parallel rate was around MWK 4,500/USD against an official rate near MWK 1,700/USD, implying a premium of approximately 150%. The official rate is highly persistent and adjusts only gradually toward the flexible parallel rate. We formalize this managed adjustment in Section 3.8 with a first-order autoregressive crawl rule for the official rate, while allowing the parallel rate to adjust flexibly.

Fiscal and Monetary Policies. Malawi’s fiscal position is in debt distress. Total public debt is about 80% of GDP, deficits run 10% of GDP, and the Reserve Bank of Malawi has historically financed a share of these deficits, contributing to 25–30% inflation (IMF (2025)). Fiscal-monetary coordination of this kind is often described as fiscal dominance and may be at odds with the inflation-targeting Taylor rules commonly used in New Keynesian models. Nevertheless, we adopt a conventional inflation-targeting Taylor rule for tractability and comparability with the international business cycle literature, as well as macroeconomic literature for Malawi such as Bangara (2019). We

⁵1/20 of GNI per capita is a cutoff used in the Global Findex question on the ability to come up with emergency funds. This cutoff has been used by Bracco et al. (2021), Mendes et al. (2026) and Mendes and Pennings (2025) as an internationally comparable measure of liquid assets.

further show in Section 8.4 and Appendix D.1 that modeling fiscal dominance along the lines of [Leeper \(1991\)](#) in our model has little effect on multipliers, mostly because the transfer is externally funded rather than being funded by domestic government debt.

International capital flows. Finally, private cross-border financial transactions in Malawi are subject to extensive foreign exchange controls and generally require authorization from the Reserve Bank of Malawi. For example, export proceeds must be surrendered to authorized dealer banks within a stipulated period (180 days), and a portion is compulsorily converted to MWK at the official rate ([IMF \(2024a\)](#)).⁶ Given these restrictions on cross-border financial transactions, we model Malawi as having restricted international capital mobility, following [Schmitt-Grohé and Uribe \(2003\)](#). Importantly, note the restriction does not apply to the GiveDirectly grant, which crosses the border as a transfer converted into MWK at the official rate.



Notes: The official rate is the daily Reserve Bank of Malawi reference rate. The parallel exchange rate is the market rate collected by the World Food Program in Lilongwe.

Implications for modeling. Given the above context, we build a small open economy New Keynesian model as in [Gali and Monacelli \(2005\)](#). We incorporate international financial frictions, as in [García-Cicco et al. \(2010\)](#), with a debt-elastic interest rate that allows for both restricted and unrestricted capital mobility. Finally, as [IMF \(2025\)](#) notes, the parallel rate in Malawi “acts as a tax on exporters and subsidizes imports,” so we follow [Pinto \(1991\)](#) in modeling the parallel exchange rate regime as a tax on exporters whose proceeds are then spent on imports.

⁶The Reserve Bank of Malawi then uses the surrendered USD for priority purchases of fuel, fertilizer, medicines, and staple foods or to accumulate reserves or pay foreign debt.

3. The Model

The model consists of a small open economy with two regions that trade both goods and bonds with the rest of the world (ROW). The two regions in the small open economy are in a monetary union: a treated region of size n , representing the Chiradzulu district in Malawi whose residents receive a GiveDirectly (GD) transfer, and the rest of the Malawian population, in a “control” region of size $1 - n$, whose residents do not receive any GD transfers. Throughout, variables without a regional superscript refer to the treated region, while superscripts $*$ and rw denote variables for the control region and the ROW, respectively. Subscripts h , f , and w denote the origin of goods from the treated region, the control region, and the ROW, respectively. A share ω of households in the treated region and a share ω^* of households in the control region are hand-to-mouth, meaning that they consume all of their income each period. The remaining shares, $1 - \omega$ and $1 - \omega^*$, respectively, are Ricardian households that can trade non-state-contingent one-period domestic and international bonds. We present the model from the perspective of the treated region, with the control region being analogous.

In addition, we incorporate nominal rigidities by assuming that firms adjust prices frequently but that many price changes are indexed to past aggregate inflation, as suggested by the evidence discussed in Section 2. This price-setting mechanism is similar to that in the DSGE model for Malawi developed by [Bangara \(2019\)](#).⁷ Finally, the model incorporates a parallel exchange rate regime while nesting the standard single-exchange-rate case. This setup allows us to calibrate the benchmark model to the Malawian economy and to consider alternative macroeconomic policy arrangements to draw broader implications for other developing countries.

3.1. Ricardian Households

Ricardian households, denoted by an R superscript, in the treated region choose consumption and labor, and can borrow and save through domestic and ROW bonds. They maximize lifetime expected utility given by

$$E_0 \sum_{t=0}^{\infty} \beta^t U(C_t^R, L_t^R), \quad (1)$$

⁷[Berg et al. \(2015\)](#) and others also impose Calvo price stickiness in their models for low-income countries such as Mozambique and Uganda.

where $\beta \in (0, 1)$ is the discount factor and C_t^R and L_t^R denote consumption and labor, respectively. Their period-by-period budget constraint is given by

$$P_t C_t^R + \frac{B_{t+1}}{R_t} + ex_t \frac{B_{w,t+1}}{R_t^{rw}} = B_t + ex_t B_{w,t} + W_t L_t^R + NTR_t^R + \Pi_t^R \quad (2)$$

where P_t is the treated region's consumption price index (CPI), and B_{t+1} and $B_{w,t+1}$ denote the face values of MWK-denominated domestic bonds and USD-denominated ROW bonds, respectively, purchased in period t and maturing in period $t+1$. Both are non-state-contingent one-period bonds. R_t and R_t^{rw} denote the nominal interest rates on domestic and ROW bonds, respectively, faced by domestic households. W_t denotes the nominal wage, ex_t is the nominal exchange rate (MWK per USD), NTR_t^R denotes nominal transfers to Ricardian households, and Π_t^R denotes firms' nominal profits distributed to Ricardian households.

Tradable and non-tradable sectors are denoted by T and S superscripts, respectively. Consumption by Ricardian households is an aggregate of tradable goods, $C_t^{R,T}$, and non-tradable goods, $C_t^{R,S}$, as follows:

$$C_t^R = \left[\alpha_C^{\frac{1}{\theta_C}} \left(C_t^{R,T} \right)^{\frac{\theta_C-1}{\theta_C}} + (1 - \alpha_C)^{\frac{1}{\theta_C}} \left(C_t^{R,S} \right)^{\frac{\theta_C-1}{\theta_C}} \right]^{\frac{\theta_C}{\theta_C-1}}, \quad (3)$$

where α_C is the weight on tradable goods in final consumption and θ_C is the elasticity of substitution between tradable and non-tradable consumption. The corresponding consumption price index is

$$P_t = \left[\alpha_C (P_t^T)^{1-\theta_C} + (1 - \alpha_C) (P_t^S)^{1-\theta_C} \right]^{\frac{1}{1-\theta_C}}. \quad (4)$$

P_t^T and P_t^S denote the price indexes of tradable and non-tradable consumption, respectively. Tradable consumption, in turn, is an aggregate of tradable goods from the treated region, denoted by the subscript (h) , the control region (f) , and the ROW (w) :

$$C_t^{R,T} = \left[(\alpha_h^T)^{\frac{1}{\theta_T}} \left(C_{h,t}^{R,T} \right)^{\frac{\theta_T-1}{\theta_T}} + (\alpha_f^T)^{\frac{1}{\theta_T}} \left(C_{f,t}^{R,T} \right)^{\frac{\theta_T-1}{\theta_T}} + (\alpha_w^T)^{\frac{1}{\theta_T}} \left(C_{w,t}^{R,T} \right)^{\frac{\theta_T-1}{\theta_T}} \right]^{\frac{\theta_T}{\theta_T-1}}, \quad (5)$$

where θ_T is the elasticity of substitution between consumption goods of different origins, and α_h^T , α_f^T , $\alpha_w^T > 0$ are weights on goods from the treated region, control region, and ROW, respectively, satisfying $\alpha_h^T + \alpha_f^T + \alpha_w^T = 1$. Non-tradable consumption is, by definition, only from the treated

region. Then, we can write the price index of tradable consumption in the treated region as follows:

$$P_t^T = \left[\alpha_h^T (P_{h,t}^T)^{1-\theta_T} + \alpha_f^T (P_{f,t}^T)^{1-\theta_T} + \alpha_w^T (P_{w,t}^T)^{1-\theta_T} \right]^{\frac{1}{1-\theta_T}}. \quad (6)$$

$P_{h,t}^T$, $P_{f,t}^T$, and $P_{w,t}^T$ denote the MWK prices of tradable goods produced in the treated region, the control region, and the ROW, respectively.⁸ Ricardian households' demand for tradable goods from the ROW is then given by

$$C_{w,t}^{R,T} = \alpha_w^T \left(\frac{P_{w,t}^T}{P_t^T} \right)^{-\theta_T} C_t^{R,T}, \quad (7)$$

The labor market is competitive and Ricardian and hand-to-mouth households face the same wage within each region. The problem of Ricardian households in the control region is analogous, with stars denoting control-region counterparts.

3.2. Hand-to-Mouth Households

Hand-to-mouth (HtM) households, denoted by the superscript N for non-Ricardian households, choose consumption and labor to maximize their lifetime expected utility, given by

$$E_0 \sum_{t=0}^{\infty} \beta^t U(C_t^N, L_t^N), \quad (8)$$

subject to the following period-by-period budget constraint:

$$P_t C_t^N = W_t L_t^N + NTR_t^N + \Pi_t^N, \quad (9)$$

where C_t^N and L_t^N denote their consumption and labor, respectively. Π_t^N denotes firms' nominal profits distributed to non-Ricardian households. We assume that profits are distributed equally on a per capita basis across household types, so that $\Pi_t^R = \Pi_t^N$. The budget constraint in equation (9) implies that hand-to-mouth households do not trade either domestic or ROW bonds and consume all of their income each period.

Similar to Ricardian households, hand-to-mouth households consume both tradable and non-

⁸We denote the USD price of tradable goods produced in the ROW by $P_{w,t}^{T,row}$, which is normalized to one. By the law of one price, $P_{w,t}^T = ex_t P_{w,t}^{T,row}$.

tradable goods, as follows:

$$C_t^N = \left[\alpha_C^{\frac{1}{\theta_C}} \left(C_t^{N,T} \right)^{\frac{\theta_C-1}{\theta_C}} + (1 - \alpha_C)^{\frac{1}{\theta_C}} \left(C_t^{N,S} \right)^{\frac{\theta_C-1}{\theta_C}} \right]^{\frac{\theta_C}{\theta_C-1}}. \quad (10)$$

Tradable consumption is a composite of tradable goods from the treated region, the control region, and the ROW:

$$C_t^{N,T} = \left[(\alpha_h^T)^{\frac{1}{\theta_T}} \left(C_{h,t}^{N,T} \right)^{\frac{\theta_T-1}{\theta_T}} + (\alpha_f^T)^{\frac{1}{\theta_T}} \left(C_{f,t}^{N,T} \right)^{\frac{\theta_T-1}{\theta_T}} + (\alpha_w^T)^{\frac{1}{\theta_T}} \left(C_{w,t}^{N,T} \right)^{\frac{\theta_T-1}{\theta_T}} \right]^{\frac{\theta_T}{\theta_T-1}}. \quad (11)$$

Hand-to-mouth households' demand for tradable goods from the ROW is then given by

$$C_{w,t}^{N,T} = \alpha_w^T \left(\frac{P_{w,t}^T}{P_t^T} \right)^{-\theta_T} C_t^{N,T}. \quad (12)$$

3.3. Final Goods Firms

In each sector, a final-goods firm aggregates differentiated intermediate goods $i \in [0, 1]$. Aggregate outputs in the tradable and non-tradable sectors are given by:

$$Y_t^T = \left[\int_0^1 Y_t^T(i)^{\frac{\epsilon_Y-1}{\epsilon_Y}} di \right]^{\frac{\epsilon_Y}{\epsilon_Y-1}}, \quad (13)$$

$$Y_t^S = \left[\int_0^1 Y_t^S(i)^{\frac{\epsilon_Y-1}{\epsilon_Y}} di \right]^{\frac{\epsilon_Y}{\epsilon_Y-1}}, \quad (14)$$

where ϵ_Y is the elasticity of substitution across intermediate goods. Profit maximization by the final goods firm then yields the demand for intermediate good i in each sector. We define total output per capita in the treated region as the sum of sectoral outputs evaluated at steady-state prices:

$$Y_t = P_{h,ss}^T Y_t^T + P_{h,ss}^S Y_t^S,$$

where the subscript ss denotes a steady-state value. Total output per capita in the control region, Y_t^* , is defined analogously.

3.4. Intermediate Goods Firms

There is a continuum of intermediate goods firms in each sector, $i \in [0, 1]$. Each firm i in the tradable sector produces a differentiated good with the following production function:

$$Y_t^T(i) = A^T L_t^T(i)^{\alpha_L}, \quad (15)$$

where A^T denotes productivity in the tradable sector, $L_t^T(i)$ is labor hired by firm i , and α_L is the output elasticity of labor. Given our focus on the short run, we do not model capital accumulation. Similarly, the production function for intermediate goods firms in the non-tradable sector is given by $Y_t^S(i) = A^S L_t^S(i)^{\alpha_L}$, where A^S denotes productivity in the non-tradable sector. We abstract from productivity shocks and use A^T and A^S only to characterize the steady state.

Intermediate-goods firms in each sector face Calvo price rigidities with indexation, consistent with the micro evidence discussed in Section 2. In particular, there is a probability θ_P that a firm cannot reset its price in a given period. Among firms that can reset their prices, a fraction $1 - \omega_{bl}$ choose their reset prices optimally, while a fraction ω_{bl} follows a backward-looking rule of thumb pricing rule. Following Galí and Gertler (1999), these firms set their prices based on the previous period's national sectoral reset price and inflation rate. Although the rule is backward-looking, the lagged reset price reflects the optimal pricing decisions of forward-looking firms in the previous period.⁹

3.5. The Rest of the World

We model the ROW as an exogenous large economy and assume that no shocks originate in the ROW. Malawi is of measure zero relative to the ROW economy, so its economic conditions do not affect ROW aggregate variables. Therefore, we do not model the ROW economy explicitly and treat its aggregate variables as exogenous. All ROW prices are denominated in USD. The ROW trades goods and bonds with Malawi and finances the cash transfers received by households in the treated region.

ROW demand for the treated region's tradable goods, normalized by the size of the treated

⁹More specifically, let $p_{h,t}^{T,bl}$ denote the log price set by a rule-of-thumb tradable-goods firm in the treated region. Its log-linearized pricing rule is

$$p_{h,t}^{T,bl} = p_{t-1}^{T,res,Agg} + \hat{\pi}_{t-1}^{T,Agg},$$

where $p_{t-1}^{T,res,Agg}$ denotes the previous period's national tradable-sector reset price in logs and $\hat{\pi}_{t-1}^{T,Agg}$ denotes the deviation of national tradable-sector inflation from its steady-state value.

region, $X_{h,t}^{T,rw}$, is given by

$$X_{h,t}^{T,rw} = \left(\frac{\tau_t P_{h,t}^T / ex_t}{P_t^{T,rw}} \right)^{-\theta_T^{rw}} \tilde{X}_{h,ss}^{T,rw}, \quad (16)$$

where $P_t^{T,rw}$ is the ROW tradable consumption price index in USD, which we assume also represents the ROW consumption price index and is constant and normalized to one, $P_t^{T,rw} = 1$. θ_T^{rw} is the elasticity of substitution between tradable goods of different origins in the ROW, $\tilde{X}_{h,ss}^{T,rw}$ is a scaling parameter calibrated to match steady-state exports-to-output ratio, and τ_t is the gross implicit export tax defined in the parallel exchange rate setup below. We use the law of one price to express the USD price of the treated region's tradable goods as $P_{h,t}^T / ex_t$. We define the real exchange rate between the treated region and the ROW as $q_t^{rw} = \frac{ex_t}{P_t} P_t^{T,rw}$ where the ROW tradable-goods price index serves as the ROW price level.

Similarly, ROW demand for the control region's tradable goods, normalized by the size of the control region, $X_{f,t}^{T,rw}$, is given by

$$X_{f,t}^{T,rw} = \left(\frac{\tau_t P_{f,t}^T / ex_t}{P_t^{T,rw}} \right)^{-\theta_T^{rw}} \tilde{X}_{f,ss}^{T,rw}, \quad (17)$$

and the real exchange rate between the control region and the ROW, $q_t^{rw,*}$, is given by $\frac{ex_t}{P_t^*} P_t^{T,rw}$. Because the two regions may have different price levels, we define the aggregate real exchange rate as the population-weighted average of the regional real exchange rates. In log-linearized form, it is given by

$$\hat{q}_t = n \hat{q}_t^{rw} + (1-n) \hat{q}_t^{rw,*}, \quad (18)$$

where hats denote log deviations from steady state.

Ricardian households in both the treated and control regions can trade USD-denominated non-state-contingent bonds. To represent frictions in international capital flows, we assume that they face a country-level debt-elastic interest rate that depends on Malawi's aggregate real net foreign asset position:

$$R_t^{rw} = \bar{R}^{rw} \Phi_{R^{rw}} \left(\frac{(1-\omega)nB_{w,t+1} + (1-\omega^*)(1-n)B_{w,t+1}^*}{P_t^{T,rw}} \right), \quad (19)$$

where $\bar{R}^{rw}$ is the nominal interest rate on bonds in the ROW. As before, $B_{w,t+1}$ and $B_{w,t+1}^*$ are nominal ROW bond holdings of Ricardian households in the treated and control regions, respec-

tively. The function $\Phi_{R^{rw}}(\cdot)$ is decreasing in Malawi's aggregate real net foreign asset position and is normalized to one in the steady state. We denote the semi-elasticity of $\Phi_{R^{rw}}(\cdot)$ with respect to its argument, evaluated at the steady state, by $\phi_{R^{rw}} < 0$. Although this specification is conventionally interpreted as a debt-elastic risk premium, we interpret it more broadly as a reduced-form representation of barriers to international borrowing and lending. These barriers may reflect financial frictions as well as administrative restrictions on international capital flows. When $\phi_{R^{rw}} = 0$, the interest rate is insensitive to foreign bond holdings, and domestic households can borrow and lend at the exogenous ROW interest rate. This case corresponds to unrestricted capital mobility. As $\phi_{R^{rw}}$ becomes more negative, the interest rate becomes more sensitive to foreign bond holdings, limiting households' ability to borrow and lend internationally. We capture Malawi's restricted capital mobility by setting $\phi_{R^{rw}} \rightarrow -\infty$.

3.6. Monetary Policy and Transfers

Monetary policy in the small open economy follows a Taylor-type interest rate rule:

$$\hat{R}_t = \rho_R \hat{R}_{t-1} + (1 - \rho_R) \left(\phi_\pi \hat{\pi}_t^{Agg} + \phi_Y \hat{Y}_t^{Agg} + \phi_{ex} \hat{ex}_t \right), \quad (20)$$

where R_t is the domestic nominal interest rate common to both regions, and π_t^{Agg} and Y_t^{Agg} are aggregate (gross) inflation and output in Malawi.¹⁰ The parameter ρ_R governs interest-rate smoothing, while ϕ_π , ϕ_Y , and ϕ_{ex} govern the responses to aggregate inflation, aggregate output, and the nominal exchange rate, respectively.

The cash transfer is financed by the ROW and is received by households in the treated region. Consistent with the GiveDirectly program described in Section 2, we model the transfer as a one-time shock. We assume that Ricardian and hand-to-mouth households receive the same nominal transfer on a per capita basis, $NTR_t^R = NTR_t^N$. Because the ROW is large relative to Malawi, financing the transfer does not affect ROW aggregate variables.

¹⁰Aggregate inflation and output are defined as weighted averages of inflation and output in the treated and control regions:

$$\hat{\pi}_t^{Agg} = n \hat{\pi}_t + (1 - n) \hat{\pi}_t^*, \quad \hat{Y}_t^{Agg} = n \hat{Y}_t + (1 - n) \hat{Y}_t^*,$$

where π_t and π_t^* denote inflation in the treated and control regions, respectively.

3.7. Market Clearing Conditions

First, output markets clear in each sector and region. In the treated region, the market-clearing conditions for the tradable and non-tradable sectors are given by

$$nY_t^T = nC_{h,t}^T + (1-n)C_{h,t}^{T,*} + nX_{h,t}^{T,rw}, \quad \text{and} \quad nY_t^S = nC_{h,t}^S. \quad (21)$$

$C_{h,t}^T$ and $C_{h,t}^{T,*}$ denote demand for tradable goods produced in the treated region by households in the treated and control regions, respectively, while $C_{h,t}^S$ denotes non-tradable consumption in the treated region. Specifically,

$$C_{h,t}^T = (1-\omega)C_{h,t}^{R,T} + \omega C_{h,t}^{N,T}, \quad C_{h,t}^{T,*} = (1-\omega^*)C_{h,t}^{R,T,*} + \omega^* C_{h,t}^{N,T,*}, \quad \text{and} \quad C_{h,t}^S = (1-\omega)C_{h,t}^{R,S} + \omega C_{h,t}^{N,S}.$$

The corresponding market-clearing conditions for the control region are analogous.

Second, the domestic bond market clearing condition is

$$(1-\omega)nB_{t+1} + (1-\omega^*)(1-n)B_{t+1}^* = 0. \quad (22)$$

3.8. Parallel Exchange Rate Setup

Malawi's parallel exchange rate regime has two exchange rates: ex_t is the flexible market-determined parallel exchange rate used in private transactions and ex_t^O is the official exchange rate which is set by the Reserve Bank of Malawi below the parallel rate. Following [Pinto \(1991\)](#) and the evidence in [Section 2](#), we model Malawi's parallel exchange rate regime as an implicit tax $\tau_t > 1$ on foreign-currency inflows (exports and GiveDirectly transfers). The gross implicit tax on foreign-currency inflows is the ratio of the two exchange rates, $\tau_t = ex_t/ex_t^O$. For exporters, this foreign-currency inflow tax operates as an implicit export tax. The revenue from the tax on treatment-region exports, control-region exports and GiveDirectly transfers is used to finance government purchases of imports in priority categories. Let G_t^{USD} denote government imports measured in real USD terms, and let TR_t^{USD} denote the real USD value of the cash transfer per capita in the treated region, the government budget constraint is given by:¹¹

$$G_t^{USD} = (\tau_t - 1) \left[n \frac{P_{h,t}^T X_{h,t}^{T,rw}}{ex_t P_t^{T,rw}} + (1-n) \frac{P_{f,t}^T X_{f,t}^{T,rw}}{ex_t P_t^{T,rw}} + n TR_t^{USD} \right]. \quad (23)$$

¹¹Consequently, $NTR_t^R = NTR_t^N = ex_t^O TR_t^{USD}$.

Holding foreign-currency inflows fixed, a larger implicit foreign-currency inflow tax, τ_t , increases government revenue and, consequently, government imports G_t^{USD} . Following the government spending literature, we simplify the model by assuming that the imports purchased with G_t^{USD} do not affect the problems of households and firms.

Empirically, the official rate is highly persistent but seems to adjust towards a target value of the parallel rate when the gap gets too large (Figure 1). We approximate this behavior by a first-order managed-crawl rule for the log official rate which slowly converges to the log parallel rate ex_t (less a steady-state tax τ_{ss}):

$$\log ex_t^O = (1 - \rho_{eo})(\log ex_t - \log \tau_{ss}) + \rho_{eo} \log ex_{t-1}^O, \quad (24)$$

where ρ_{eo} is a parameter that governs the smoothness of the crawl in the official rate. When $\rho_{eo} = 0$, the official rate is flexible and equal to the parallel rate less a fixed implicit export tax; as $\rho_{eo} \rightarrow 1$, the official rate becomes a hard peg. Substituting the crawl rule into the definition $\tau_t = ex_t/ex_t^O$ and log-linearizing around the steady state shows that the implicit export tax inherits its persistence from the crawl parameter and responds to movements in the parallel rate:¹²

$$\hat{\tau}_t = \rho_{eo} \hat{\tau}_{t-1} + \rho_{eo} (\hat{ex}_t - \hat{ex}_{t-1}) \quad (25)$$

3.9. Solution method

We solve the model using a first-order approximation around the steady state, which is standard for this class of New Keynesian models. While the ongoing GiveDirectly transfer program is small relative to the national economy, it is large relative to the treated region. Our approximation, therefore, abstracts from potential nonlinearities in local responses and in large scale-up experiments.

4. Model calibration

This section presents the calibration of our model. We exploit the microdata collected through the GiveDirectly RCT surveys in Chiradzulu and Khongoni to calibrate key parameters such as

¹²An exact hard peg ($\rho_{eo} = 1$) results in a non-stationary export tax. Determinacy fails near $\rho_{eo} \approx 0.98$ in our linearized system (the exact point depends on the Taylor rule coefficients); we therefore calibrate $\rho_{eo} = 0.95$ in the baseline. This also captures the noticeable drift of the official rate towards the parallel rate in Figure 1 over a horizon of a few years.

price setting, the fraction of hand-to-mouth households, and the local content of consumption in the treated region.

Price stickiness. We calibrate the fraction of firms that do not adjust prices using the average age of prices in the enterprise survey. The average price age of 4.4 months implies a quarterly probability of not adjusting prices of approximately 0.5. Since our model is annual, we set $\theta_P = 0.5^4 = 0.0625$, implying that almost all firms adjust prices within a year. The share of rule-of-thumb indexers is calibrated using the enterprise survey responses to the hypothetical demand shock question. Specifically, among those firms that can reset prices, 80% are rule-of-thumb indexers, i.e., $\omega_{bt} = 0.8$, compared with 25–50% in the United States as in [Galí and Gertler \(1999\)](#). As we show below, these calibrated parameters imply that prices respond only weakly to the local demand shock in the first year, resulting in little first-year inflation.

Home bias in the treated region. We calibrate the home bias in consumption in the treated region to 0.57 using the surveys in Chiradzulu. We define “home” geographically as the Traditional Authority (TA), a sub-district administrative unit containing, on average, 90 villages. Home bias is defined as the fraction of total household expenditure that accrues as income to households within the household’s own TA. The calibration combines information from our two main micro datasets: the household and enterprise baseline surveys. We estimate home bias separately for Southern and Northern Chiradzulu and report the midpoint between the two estimates. Estimating the home bias parameter requires three objects. First, we use the household survey to identify where purchases are made and how expenditure is distributed across locations and sectors. Second, we use the enterprise survey to estimate where sellers in each market live, which determines the share of expenditure accruing to residents of the household’s TA. Third, we adjust for intermediate inputs sourced outside the TA to recover the local content of each dollar received by local sellers, including labor compensation, profits, and locally sourced intermediate inputs. These calculations are made separately for food, non-food, and services. We then aggregate the resulting local content across sectors and purchase locations to obtain a measure of home bias that is representative of Chiradzulu as a whole. Further details are presented in [Appendix A](#). This procedure yields a home bias estimate of 0.57 for the treated region, which implies that $\alpha_C = 0.43$, under the assumption that the treated-region share in tradable consumption at the steady state, α_h^T , is close to zero. We note that home bias of 0.57 is lower than the estimated home bias in the Siaya county of Kenya in [Egger et al. \(2022\)](#). We discuss the implications of this parameter further in [Section 8](#).

Fraction of hand-to-mouth households. As discussed in Section 2, we calibrate the hand-to-mouth share ω to be 0.95, based on the fraction of households with liquid savings and an MPC of close to one from large one-time transfers in Khongoni subdistrict (Appendix Figure B6).¹³

Trade shares with the ROW. We also calibrate steady-state trade flows between Malawi and the ROW as follows. Over the last five years, Malawi’s exports and imports have accounted for 11% and 31% of GDP, respectively. First, we assume balanced trade in the steady state for simplicity. Second, we assume that half of tradable consumption in each region is imported from the ROW, i.e. $\alpha_w^T = \alpha_w^{T,*} = 0.5$. We assume that trade between the treated and control regions is balanced in the steady state. With the tradable share of consumption, α_C , set to be 0.43, our calibration implies that exports and imports each account for 21.5% of GDP in the steady state.

Monetary Policy, the Exchange Rate, and Capital Flows. As discussed in Section 2, our baseline calibration reflects the macroeconomic environment in Malawi, though we consider alternative macro-policy environments in Section 7. Malawi has a parallel exchange rate regime with restricted capital mobility. Accordingly, we set ϕ_{R^w} to a large negative value ($-10,000$), so that Ricardian households in Malawi effectively cannot borrow and lend internationally, and we set the persistence of the official exchange rate rule to $\rho_{eo} = 0.95$, so that the official exchange rate adjusts only gradually, consistent with the data. We calibrate the steady-state gross implicit export tax, τ_{ss} , to 2.5, corresponding to a 150% parallel exchange rate premium, consistent with the gap between the official and parallel exchange rates in Malawi in late 2025.

We calibrate the monetary policy rule using standard values from the literature: interest-rate smoothing parameter, ρ_R , is set to 0.8, and the parameters governing the responses to inflation and output, ϕ_π and ϕ_Y , are set to 1.5 and 0.5, respectively. In the baseline, we set $\phi_{ex} = 0$, so the monetary policy rule does not respond directly to the nominal exchange rate.

Other parameters. The rest of the calibrated parameters are reported in Table 1. Since the model is calibrated at an annual frequency, we set β to 0.96. Following Bilbiie (2009) and Furlanetto and Seneca (2014), we set the Frisch elasticity of labor supply to 1, the intertemporal elasticity of

¹³The share of households with liquid savings is calculated by converting US\$30 (1/20 of GNIPC) into MWK at the official exchange rate for the Phase I household survey, and then updating MWK cutoff for inflation for the Phase II survey (which was conducted 9 months later, on average). The fraction of households with liquid savings below the cutoff, averaged across the two surveys, is 0.93, which we round to 0.95.

substitution to 1, and the parameter governing the wealth effect on labor supply to 0.65.¹⁴ These parameters, together with the steady-state ratio of consumption to labor income, fully characterize household preferences to a first-order approximation. In the baseline, the size of the treated region is $n = 1/200$, reflecting the size of Chiradzulu’s economy relative to Malawi.

We assume that the elasticity of substitution between tradable and non-tradable consumption, θ_C , is 1, so the consumption aggregator is a Cobb-Douglas function of tradable and non-tradable consumption. The elasticity of substitution among goods from the treated region, the control region, and the ROW, θ_T , is set to 2, a value commonly used in the literature, such as Nakamura and Steinsson (2014). We also set the elasticity of substitution for ROW demand for Malawi’s exports, θ_T^{rw} , to 2.¹⁵

In addition to calibrating the frequency of price adjustment and the shares of rule-of-thumb firms, we set the elasticity of substitution across intermediate goods, ϵ_Y , to 21. In the production function, the labor elasticity, α_L , is set to 0.66, approximately $2/3$, as is common in the literature. We maintain the assumption that both Ricardian and hand-to-mouth households receive the same amount of profits per capita from firms.

5. The Local Transfer Multiplier

This section characterizes the effects of cash transfers on the local economy of the treated region. To build intuition, we first derive analytical expressions for the local output multiplier under two limiting cases: Keynesian and neoclassical. We then quantify the local multiplier for Malawi using our full model.

5.1. Analytical Results and Intuition

We derive analytical expressions for the local multiplier, defined as the change in real local GDP per unit of real cash transfer received by the treated region. To that end, we simplify the model by assuming (i) separable log preferences ($\gamma_u = \sigma = 1$), and (ii) no non-tradable sector ($\alpha_C \rightarrow 1$) and additional assumptions listed in Appendix C. Note that in this simplified model, there can

¹⁴As in Bilbiie (2009) and Furlanetto and Seneca (2014), we do not specify the functional form of the utility function. We note that the parameter governing the wealth effect on labor supply is 1 under standard separable preferences and 0 under Greenwood et al. (1988) preferences.

¹⁵There is a wide range of estimates for the elasticities of substitution across sectors and countries: the international macroeconomic literature estimates of the elasticity of substitution across countries are typically small, around 1. A recent paper by Boehm et al. (2023) estimates a short-run elasticity of less than one. We assume $\theta_T^{rw} = 2$ for goods in Malawi considering most of its exports are tobacco and other primary commodities.

Table 1: Model Parameters and Calibrated Values

Parameter	Value	Explanation
β	0.96	Discount factor
σ	1	Inverse of the intertemporal elasticity of substitution
γ_u	0.65	Wealth-effect parameter on labor supply
ψ	1	Inverse of the Frisch elasticity of labor supply
n	0.005	Relative size of treated region
α_C	0.43	Share of tradable goods in consumption
$\alpha_w^T, \alpha_w^{T,*}$	0.5	ROW shares in tradable consumption
α_h^T	$n(1 - \alpha_w^T)$	Treated-region share in tradable consumption
α_f^T	$1 - \alpha_h^T - \alpha_w^T$	Control-region share in tradable consumption
θ_C	1	Elasticity of substitution between tradable and non-tradable consumption
θ_T	2	Elasticity of substitution among tradable goods of different origins
θ_T^{rw}	2	Export elasticity
ϵ_Y	21	Elasticity of substitution across intermediate goods
θ_P	0.0625	Probability of not adjusting prices
ω_{bl}	0.8	Share of rule-of-thumb price setters
α_L	0.66	Output elasticity of labor
ω	0.95	Hand-to-mouth share in the treated region
ω^*	0.63	Hand-to-mouth share in the control region
$\phi_{R^{rw}}$	-10,000	Risk-premium semi-elasticity
ρ_R	0.8	Interest rate smoothing parameter
ϕ_π	1.5	Taylor rule response to inflation
ϕ_Y	0.5	Taylor rule response to output
ϕ_{ex}	0	Taylor rule response to the nominal exchange rate
ρ_{eo}	0.95	Official exchange rate smoothing parameter
τ_{ss}	2.5	Steady-state gross implicit export tax

still be local consumption home bias, but it is given by the home bias in *tradable* consumption, $hb = \alpha_h^T > 0$.

Keynesian Local Multiplier. Consider the limit in which (i) the treated region is small relative to the national economy ($n \rightarrow 0$), (ii) prices are fully rigid, and (iii) households are patient ($\beta \rightarrow 1$). The local multiplier for an untargeted one-time transfer then takes the following closed form:¹⁶

$$\mathcal{M}_K^{Local} = \frac{\omega \times hb}{1 - \omega \times hb}. \quad (26)$$

¹⁶The first assumption means that the treated region is effectively a small open economy trading with the much larger rest of Malawi and the ROW, and aggregate variables such as the exchange rate and interest rate are unaffected by the local transfer. A more general formulation for any β is

$$\mathcal{M}_K^{Local} = \frac{hb[(1 - \beta) + \omega(\beta - hb)]}{(1 - hb)(1 - hb\omega)}.$$

Equation (26) captures the standard Keynesian demand multiplier logic. When hand-to-mouth households receive a \$1 transfer, they spend a fraction hb locally, generating $hb \times \omega$ dollars of local income. This additional income is in turn spent locally, and so on, giving rise to an increase in local demand of $\omega \times hb + (\omega \times hb)^2 + \dots = \frac{\omega \times hb}{1 - \omega \times hb}$. For example, with $\omega = 1$ and $hb = 0.5$, the multiplier equals one. If home bias is higher, as in the Kenyan setting studied by Egger et al. (2022), where $hb = 0.75$, the multiplier rises to three.

Home bias is so important for the Keynesian expression because it determines how much the economy has to expand until new demand for imported goods (from the control region and ROW) is equal to the size of the transfer. With $\omega = 1$, a \$1 transfer generates only $\$(1-hb)$ in demand for imported goods if there is no increase in local GDP, which is less than the \$1 transfer. This generates excess demand for home goods. With relative prices fixed, the only way to equalize supply and demand is for local GDP (Y) to expand until households want to import exactly one dollar from the control region and the ROW: $(1 - hb)(\Delta Y + 1) = 1$. This equation, rearranged, implies output expands by $\Delta Y = hb/(1 - hb)$, which corresponds to equation (26) when $\omega = 1$.

Neoclassical Local Multiplier. Consider the opposite limit in which prices are fully flexible ($\theta_P \rightarrow 0$) and all households are Ricardian ($\omega \rightarrow 0$), and the treated region is small ($n \rightarrow 0$). The local multiplier is then given by:

$$\mathcal{M}_N^{Local} = -\frac{\alpha_L(1 - \beta)}{1 + \psi}, \quad (27)$$

where, as in the full model, ψ is the inverse Frisch elasticity, α_L is the output elasticity of labor, and β is the discount factor. The neoclassical multiplier for a temporary transfer is negative but close to zero. Ricardian households spend only the permanent component of the transfer, $1 - \beta$, and save the rest. In addition, households reduce labor supply because the transfer increases their wealth. This standard wealth effect on labor supply depends on the inverse Frisch elasticity, ψ , under separable preferences. Reduced labor supply lowers output, and the magnitude of the decline depends on α_L . Consumption home bias does not appear in equation (27) because the increase in local demand is accommodated through price adjustments rather than output expansion. With our calibrated parameters in Table 1, $\mathcal{M}_N^{Local} = -0.01$, as most of the transfer is saved.

These two limiting cases also clarify the key parameters driving the size of the local multiplier. Price stickiness determines whether the local economy responds to the transfer primarily through quantities (the Keynesian channel) or prices (the neoclassical channel). When prices are sticky, firms respond to higher demand by producing more rather than raising prices, generating a posi-

tive output multiplier with little inflation. The hand-to-mouth share is a key determinant of the marginal propensity to consume out of the transfer: hand-to-mouth households spend the transfer immediately, whereas Ricardian households smooth the temporary income gain over time, dampening the demand stimulus. Therefore, a larger fraction of hand-to-mouth households increases the local output multiplier. Finally, the degree of home bias determines the fraction of additional spending that falls on locally produced goods and thereby generates local income, rather than on imports from the control region or the rest of the world. Thus, greater home bias increases the local output multiplier.

5.2. Quantitative Local Multipliers

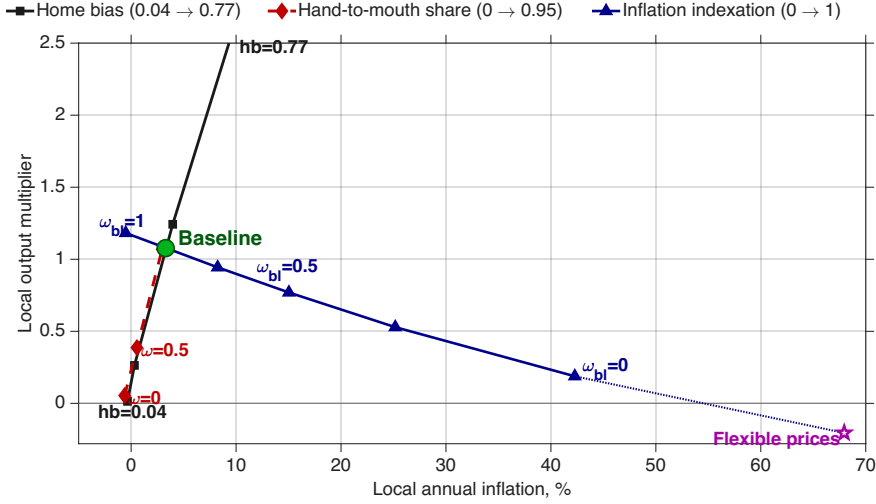
Figure 2 plots the first-year local output multiplier and local inflation under different parameterizations when the treated region is small relative to the national economy, as in the Chiradzulu RCT, where $n \approx 0.005$. In the baseline calibration, the model implies a local output multiplier of 1.08 and a local inflation response of 3.29 percentage points. That is, for every MWK of real transfers received by the treated region, real local output increases by MWK 1.08. The relatively small inflationary response reflects the fact that most firms adjust prices using a rule of thumb based on past aggregate inflation rather than current local demand conditions, consistent with the micro evidence from the Khongoni pilot and the Chiradzulu enterprise survey.

Figure 2 also shows how the local multiplier and inflation change as we vary each of the three key parameters highlighted by the analytical results: the degree of price indexation, the hand-to-mouth share, and home bias. First, consistent with the analytical results, greater price flexibility reduces the local output multiplier and increases inflation. This is captured in Figure 2 by a decline in the share of rule-of-thumb price setters, ω_{bl} , from $\omega_{bl} = 1$ to $\omega_{bl} = 0$. The reason is that as the share of rule-of-thumb price setters falls, more firms reset prices optimally, and the New Keynesian demand channel weakens. Figure 2 also reports the limiting case of fully flexible prices, where the local output multiplier becomes negative, consistent with the neoclassical multiplier in equation (27).

Second, consistent with the Keynesian multiplier in equation (26), a larger hand-to-mouth share increases the local output multiplier. When there are no hand-to-mouth households in the treated region, the local output multiplier is close to zero, as Ricardian households save most of the one-time transfer. Finally, greater home bias also increases the local output multiplier, as it implies greater demand for locally produced goods. When $hb = 0.77$ or $\alpha_C = 0.23$ in our calibration, the

local output multiplier is close to 2.57.

Figure 2: Local output multiplier versus local inflation across parameterizations



Notes: The figure plots the local output multiplier against local inflation in the first year across alternative model parameterizations. Along each sweep, one parameter varies while the remaining parameters are held at their baseline values. The estimate with the baseline calibration is represented by the green circle. The parameter grid varies home bias (black sweep with square markers), the hand-to-mouth share (red sweep with diamond markers), and inflation indexation (blue sweep with triangle markers). The flexible-price case with $\theta_P = 0$ and $\omega_{bl} = 0$ is the purple star.

We also compute the local *consumption* multiplier and report the results in Appendix Figure B1. In our baseline calibration, every MWK of real cash transfer raises local consumption by about MWK 2, which is larger than the local output multiplier of 1.08. This difference reflects the leakage through imports: because home bias is 0.57 in the baseline, roughly half of the increase in consumption is spent on goods produced outside the treated region, so the increase in local output is smaller than the increase in consumption. Transfers boost local consumption even with fully flexible prices, and even if local output does not increase. As with the output multiplier, the size of the consumption multiplier depends on the hand-to-mouth share, price stickiness, and home bias.

6. Aggregate Multipliers and the Macroeconomic Effects of Scaled-Up Cash Transfers in Malawi

This section presents the aggregate multiplier in Malawi and analyzes how scaling up cash transfers may affect both local and aggregate output multipliers.

6.1. Local, Spillover, and Aggregate Multipliers in Malawi

Our analysis considers three measures of the change in output per unit of transfer *received by households in the treated region*. All three measures use the same transfer received by treated

households as the denominator. The *local multiplier*, denoted by $\mathcal{M}^{Local}$, measures the change in output in the treated region per unit of GiveDirectly (GD) transfer received by treated households, and was the focus of the discussion in Section 5. The *spillover multiplier*, $\mathcal{M}^{Spill}$, measures the change in output in the control region per unit of GD transfer received by treated households, thereby capturing the spillover from the treated to the control region. In the baseline calibration, the control region is much larger than the treated region, so the spillover is small as a percentage of control-region output but can be substantial in levels and materially affect the aggregate multiplier. Finally, the *aggregate multiplier*, $\mathcal{M}^{Agg}$, measures the change in national output per unit of transfer received by treated households and is therefore the sum of the local and spillover multipliers:

$$\mathcal{M}^{Agg} = \mathcal{M}^{Local} + \mathcal{M}^{Spill}. \quad (28)$$

The three columns under “Default ($n = 0.005$)” in Table 2 report the local, spillover, and aggregate multipliers for the simulated GiveDirectly transfer to Chiradzulu. In the baseline calibration with restricted capital mobility and a parallel exchange rate regime, the local multiplier is 1.08 as in Section 5, and the aggregate output multiplier is 0.72. This result implies a *negative* spillover to the rest of Malawi: the spillover multiplier is -0.35 , meaning that for every MWK of real transfer received by the treated region, output in the control region falls by approximately MWK 0.35.

To understand what explains the negative spillovers and the aggregate multiplier in Malawi, we separate the different channels in the model using a counterfactual with no parallel exchange rate. Row B1 of Table 2 reports the multipliers when we shut down the parallel-rate channel by setting $\rho_{eo} = 0$, so that the official rate tracks the parallel rate one-for-one and the gross implicit export tax τ_t is constant, and does not affect model dynamics.¹⁷ The local multiplier is unchanged at 1.08, but the aggregate multiplier falls to 0.63, so the spillover to the control region is even more negative (-0.45).

Why is the spillover negative? Intuitively, under restricted capital mobility, the GiveDirectly transfer is a USD inflow that cannot be absorbed through an increase in foreign asset holdings because Malawian households cannot freely save abroad. Therefore, the entire USD inflow must be absorbed through an adjustment in the trade balance, either through higher imports or lower exports. In our calibration, home bias limits how much of the transfer is spent directly on imports, so the remainder is absorbed through the appreciation of the real exchange rate. This appreciation

¹⁷Simulations setting $\tau_{ss} = 1$ (with a recomputed steady state) are numerically identical.

makes Malawian tradables more expensive for the rest of the world, reducing foreign demand for the control region’s tradable goods. Control-region output therefore falls, generating a negative spillover and an aggregate multiplier below the local multiplier.

The results with and without the parallel exchange rate also show that the parallel rate regime partially offsets the negative spillover generated by restricted capital mobility: the aggregate multiplier rises from 0.63 to 0.72. The reason is that the GiveDirectly transfer partially undoes the distortionary effect of the implicit tax on exports. When the GD transfer arrives, the private supply of foreign exchange rises. As a result, the parallel rate appreciates on impact, while the official rate adjusts only gradually because ρ_{eo} is large. Since the parallel rate appreciates more than the official rate, the gross implicit export tax, $\tau_t = ex_t/ex_t^O$, falls (recall an appreciation is a fall in the exchange rate). A lower implicit export tax raises foreign demand for the control region’s tradables, partially offsetting the negative effects of restricted capital mobility. Quantitatively, the strong negative spillover from restricted capital mobility dominates the positive effect of the parallel exchange rate regime, so the aggregate multiplier remains lower than the local multiplier.

Finally, the parallel exchange rate regime provides an alternative way to evaluate the transfer multiplier. With a single exchange rate, the multiplier is independent of the currency in which output and transfers are valued. In Malawi, however, the government requires donor funds to be converted into local currency at the official exchange rate, while domestic output arguably should be valued at the parallel exchange rate. Therefore, we consider an alternative definition of the multiplier that accounts for this valuation wedge. For this alternative measure, we value the output response in USD converted using the steady-state parallel exchange rate and the transfer using the steady-state official exchange rate. Intuitively, this measure accounts for the implicit tax on the transfer: because donor funds are converted at the less favorable official rate, more donor dollars are required for a given value of transfers at the parallel exchange rate. Because the steady-state official exchange rate is only 40% of the steady-state parallel exchange rate, every multiplier shrinks toward zero under this alternative definition. As reported in row A2 (Alternative) in Table 2, the local multiplier falls from 1.08 to 0.43, and the aggregate multiplier falls from 0.72 to 0.29. The choice of valuation, therefore, matters substantially for headline numbers, although it does not affect the underlying economic mechanism.

We note that our baseline simplifies Malawi’s monetary-fiscal arrangements discussed in Section 2, such as the allocation of expenditure, differential foreign-currency surrender rates and fiscal dominance. While local multipliers do not depend on macro-policy arrangements when the treated

region is small, these monetary-fiscal arrangements could potentially affect the aggregate multiplier. We study an extension with fiscal dominance in Section 8.4, and the results suggest the effects of fiscal dominance on the aggregate multiplier are modest: the aggregate multiplier is still less than the local multiplier, and consequently, our main qualitative results continue to hold.

Table 2: Local, spillover, and aggregate multipliers under alternative macro-policy regimes

Specification	Default ($n = 0.005$)			Scale-up ($n = 0.15$)		
	$\mathcal{M}^{Local}$	$\mathcal{M}^{Spill}$	$\mathcal{M}^{Agg}$	$\mathcal{M}^{Local}$	$\mathcal{M}^{Spill}$	$\mathcal{M}^{Agg}$
<i>Panel A: Malawi Baseline (Restricted capital mobility with parallel exchange rate)</i>						
A1. Default Definition	1.08	-0.35	0.72	0.86	-0.47	0.40
A2. Alternative	0.43	-0.14	0.29	0.34	-0.19	0.16
<i>Panel B: Restricted capital mobility</i>						
B1. Flexible exchange rate	1.08	-0.45	0.63	0.84	-0.56	0.28
<i>Panel C: Unrestricted capital mobility</i>						
C1. Flexible exchange rate	1.08	0.48	1.56	1.06	0.35	1.41
C2. Fixed exchange rate	1.09	0.95	2.03	1.13	0.71	1.84

Note: This table reports the local, spillover, and aggregate multipliers for the Malawi baseline and alternative macro-policy regimes. The Default columns ($n = 0.005$) report multipliers at the scale of the Chiradzulu RCT, while the Scale-up columns ($n = 0.15$) report the counterfactual scale-up. n is the size of the treated region. Panel A reports the baseline Malawi model, which assumes restricted capital mobility and a parallel exchange rate regime. A1. Default defines the multiplier as the ratio of the change in GDP to the transfer received by households. A2. Alternative values the GDP response using the steady-state parallel exchange rate and the transfer using the steady-state official exchange rate. Panel B reports results under an alternative macro-policy regime that maintains restricted capital mobility but shuts down the parallel exchange rate regime, yielding a single floating exchange rate regime. Panel C reports results under unrestricted capital mobility, with a flexible exchange rate (C1) and a fixed exchange rate regime (C2). Note that $\mathcal{M}^{Local}$, $\mathcal{M}^{Spill}$, $\mathcal{M}^{Agg}$ may not add up due to rounding.

6.2. Scaling up cash transfers in Malawi

This subsection uses our framework to study how the local and aggregate effects of cash transfers might change if the GiveDirectly program scales up in Malawi. We model this as an increase in n , the size of the treatment region. The main takeaway is that, under the macroeconomic environment in Malawi, both the local and aggregate multipliers decline as the program expands, and the local multiplier converges toward the aggregate multiplier.

As the transfer program scales up, i.e. n increases, the composition of hand-to-mouth households in the treated and control regions changes. In our default calibration ($n = 0.005$), the hand-to-mouth share of the treated region is calibrated to be $\omega = 0.95$, larger than the share in the rest of Malawi at $\omega^* = 0.63$. As the treated region expands, we assume that transfers are extended progressively from the poorest to the richest areas, and that poorer areas have higher hand-to-mouth shares. Specifically, we assume that the marginal hand-to-mouth share among newly treated

households declines linearly from 0.95 among the poorest households to 0.31 among the richest, with the latter matching the US hand-to-mouth share in [Kaplan et al. \(2014\)](#). This implies the following average hand-to-mouth shares in the treated and control regions, respectively:

$$\omega(n) = 0.95 - 0.32n, \quad \omega^*(n) = 0.63 - 0.32n.$$

This formulation ensures that the population-weighted national hand-to-mouth share, $n\omega(n) + (1-n)\omega^*(n)$, is held fixed at its Malawi-wide value of 0.63 for every n .¹⁸

We then simulate the model’s multipliers as the size of the treated region increases from $n = 0.005$, representing the Chiradzulu district, up to $n = 1$, representing the entire population of Malawi. GiveDirectly’s stated long-term goal is to reach all Malawians in extreme poverty, roughly 75% of the population, though that is a longer-term objective. For a more plausible medium-term expansion, we highlight $n = 0.15$. Since transfers amount to about 70% of GDP in treated villages, treating 15% of the population corresponds to transfers of approximately 10% of national GDP.

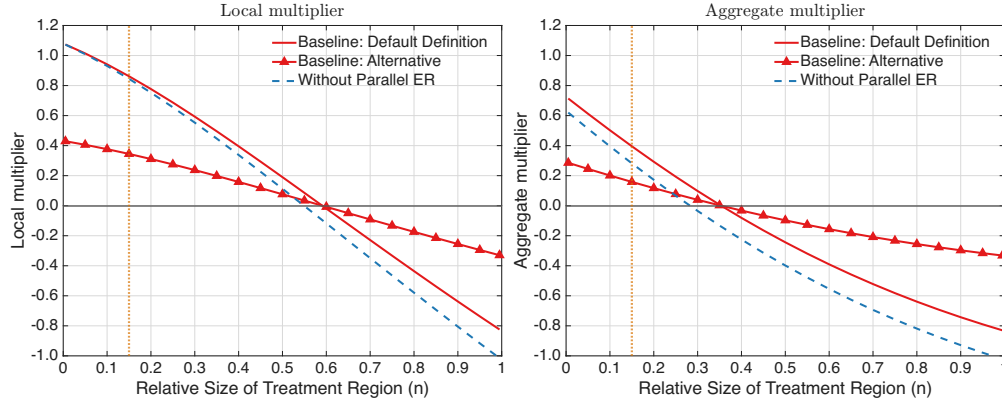
Figure 3 plots the local (left panel) and aggregate (right panel) multipliers in Malawi as n grows from close to 0 to 1, in the baseline (parallel exchange rate, restricted capital mobility) and in the specification without a parallel exchange rate. The values for $n \approx 0$ correspond to those in the first three columns of Table 2. The orange dotted vertical lines mark the local and aggregate multipliers when $n = 0.15$, which we also report in the last three columns of Table 2. When n is relatively small, the local multipliers do not depend on the macroeconomic policy environment: i.e. the local multipliers are the same under the restricted capital mobility case with (red line) and without (blue dotted line) a parallel exchange rate. Intuitively, when the treated region is small, the local shock has negligible effects on aggregate variables. Since macroeconomic policy is determined by aggregate conditions, the particular macroeconomic policy rule does not affect the local response.

Both local and aggregate multipliers fall as n grows. There are two reasons for this result. First, the aggregate multiplier falls due to the lower hand-to-mouth share in the treated and control regions.¹⁹ This weakens the demand channel in both regions. If instead the hand-to-mouth shares

¹⁸Our assumption about how the hand-to-mouth share varies with income is consistent with micro data from the 2017 World Bank Global Findex. Appendix Figure B2 plots the share of households unable to access emergency funds by income quintile. This share falls from 80% in the poorest quintile to 40% in the richest quintile, and is broadly consistent with the marginal distribution that we assume in our counterfactual.

¹⁹Recall, we assume that scaling up progressively adds richer households to the treated region and removes them from the control region, reducing the HtM share of both: while the Malawi-wide hand-to-mouth share is fixed at 0.63, the hand-to-mouth shares in the treated and control regions both fall by $0.32n$.

Figure 3: Scaling up cash transfers in Malawi: local and aggregate output multipliers



Notes: The figure plots the local (left) and aggregate (right) output multipliers of a one-time cash transfer as a function of the relative size of the treated region n , for two policy regimes: the baseline restricted capital mobility with a parallel exchange rate regime (red lines) and the restricted capital mobility with a single exchange rate regime (blue dotted lines). For the baseline regime, we report both the default and alternative multiplier definitions. The solid lines show the default multipliers, defined as the change in GDP per unit of transfer received by households, while the dashed lines show the alternative multipliers, which value the GDP response using the steady-state parallel exchange rate and the transfer using the steady-state official exchange rate. As the treated region scales up, the treated-region hand-to-mouth share ω and the control-region share ω^* vary with n according to the linear rule $\omega(n) = 0.95 - 0.32n$ and $\omega^*(n) = 0.63 - 0.32n$, so that the population-weighted national hand-to-mouth average is held fixed at the national value of 0.63 for all n (i.e. $n\omega + (1-n)\omega^* = 0.63$). The orange dotted vertical line indicates $n = 0.15$.

were constant and equal across regions, then scaling up would not have any effect on the aggregate multiplier (see Appendix Figure B3).

Second, as the treated region accounts for a larger share of the national economy, the local multiplier converges toward the aggregate multiplier. At $n = 1$, the local and aggregate multipliers are identical. The direction of this convergence depends on the sign of the spillover. In our baseline, the spillover is negative, so the aggregate multiplier is below the local multiplier, and the local multiplier converges downward toward the aggregate multiplier as n increases.

For a program of plausible scale at $n = 0.15$, as reported in Table 2, the local multiplier is 0.86, which is about 20 percent smaller than when the program is limited to the Chiradzulu district. Additionally, the aggregate multiplier at $n = 0.15$ is 0.40, a 45% reduction. The parallel exchange rate regime continues to increase the aggregate multiplier substantially relative to the case without parallel exchange rate, reported in the last three columns of line B1 in Table 2, although its effect on the local multiplier remains small. When the transfer program covers a large share of Malawi's population (over 40%), the aggregate multiplier turns negative, i.e. the transfer program becomes contractionary. The parallel exchange rate mechanism reduces but does not eliminate this effect quantitatively.

Finally, scaled-up transfers also have a substantial impact on Malawi’s first-year GDP growth. Because our transfer shock is one-off, the first-year growth impact is given by the size of the transfer as a share of national GDP multiplied by the aggregate multiplier. As the program scales up, transfers as a share of national GDP increase but the aggregate multiplier falls. Therefore, the direction of the impact on GDP growth is ambiguous. Quantitatively, Appendix Figure B4 shows that the impact on GDP growth is inverted-U shaped in program scale. As the treated region expands to around 0.15-0.2 of the population, the growth impact increases before falling back to zero and eventually becoming negative for very large programs. In our $n = 0.15$ case, the size of the transfer is about 10% of GDP, so the cash transfer increases first-year GDP growth by about 4 percentage points in the baseline, compared to 2.8 percentage points with only restricted capital mobility.

Overall, this counterfactual exercise shows that general equilibrium effects and changes in the hand-to-mouth share are likely to reduce the local output multiplier in Malawi as the program scales up. More broadly, village-level RCT multiplier estimates alone are insufficient to infer the aggregate effects of a scaled-up program, because these effects depend crucially on the macroeconomic policy environment, as we show in the next section.

7. How Do the Multipliers Change Across Macro-Policy Environments?

While the macro policy environment in Malawi is characterized by restricted capital mobility and a parallel exchange rate, other countries that receive GiveDirectly transfers have very different institutional settings. For example, Kenya has relatively open international capital markets, and a mostly flexible exchange rate without a parallel market (see IMF (2024b)). This section analyzes how our aggregate multiplier changes across different macro-policy environments.

We vary the macroeconomic environment along two dimensions: international capital mobility, which determines the extent to which Ricardian households can borrow and lend internationally, and the exchange rate regime, which can be fixed or flexible. To simplify exposition, we do not consider the parallel exchange rate regime, which is now rare even in developing countries. As in the Malawi baseline, we impose restricted capital mobility by setting $\phi_{R^{rw}}$ to a large negative value. Under unrestricted capital mobility, we set $\phi_{R^{rw}} = 0$. We impose a fixed exchange rate by setting $\phi_{ex} \rightarrow \infty$ in the Taylor rule; under a flexible exchange rate, $\phi_{ex} = 0$. All other parameters are held at the Malawi calibration in Section 4.

The first three columns of Panels B and C of Table 2 report the local, spillover, and aggregate

multipliers on impact under these three macroeconomic policy regimes. There are two main findings. First, the local multiplier is essentially unaffected by the macro-policy regime: in all three regimes, the local multiplier is 1.08. As discussed above, when the treated region is small, the local shock has negligible effects on aggregate variables. Since macroeconomic policy rules respond to aggregate variables, the particular policy rule has little effect on the local economy. Second, the aggregate multiplier, by contrast, ranges from 0.63 (restricted capital mobility and flexible exchange rate) to 2.03 (unrestricted capital mobility and a fixed exchange rate) with the same underlying calibration. Unrestricted capital mobility with a flexible exchange rate, which most closely resembles Kenya’s macroeconomic environment, lies in the middle, with an aggregate multiplier of 1.56. As in Section 6, restricted capital mobility with a flexible exchange rate generates a negative spillover multiplier, so the aggregate multiplier is smaller than the local multiplier. In contrast, the spillover multiplier is positive under unrestricted capital mobility with either a flexible or a fixed exchange rate, so the aggregate multipliers are larger than the local multiplier.

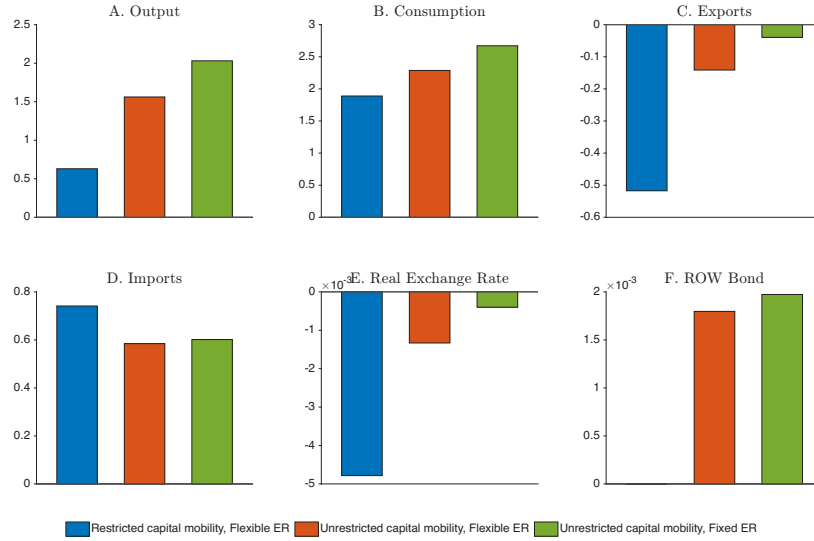
The intuition for this result is as follows. Cash transfers in the treated region have two opposing effects on the control region, and the macro-policy regime determines which effect dominates. On the one hand, there is a positive spillover mechanism: cash transfers in the treated region increase the treated region’s demand for the control region’s goods. On the other hand, there is also a negative spillover mechanism: cash transfers lead to a foreign currency inflow, a real exchange rate appreciation and a fall in international demand for the control region’s goods.²⁰ Because prices are sticky, changes in demand for the control region’s goods translate into changes in tradable output in the control region.

Figure 4 plots the on-impact responses of national macroeconomic variables to the one-time cash transfer shock in the treated region. Under restricted capital mobility (blue bars), Ricardian households cannot save the temporary inflow abroad by buying ROW bonds (Panel F), so the trade balance must adjust instead, resulting in a large real exchange rate appreciation (Panel E) and a fall in exports (Panel C).

However, with unrestricted capital mobility and a flexible exchange rate regime (orange bars), Ricardian households save part of the temporary transfer abroad by purchasing ROW bonds, reducing the required trade-balance adjustment. The exchange rate appreciates by much less than

²⁰The empirical literature provides different estimates of the effects of fiscal policy on the real exchange rate in developing countries. For example, while Miyamoto et al. (2019) document that government spending shocks tend to appreciate the real exchange rate in developing countries, Jarotschkin and Kraay (2016) find no evidence of real appreciation due to foreign aid.

Figure 4: On-impact responses of national macro variables in different macro-policy regimes



Notes: The three regimes are: restricted capital mobility and flexible exchange rate (blue bars), unrestricted capital mobility and flexible exchange rate (orange bars), and unrestricted capital mobility and fixed exchange rate (green bars). A decline in the real exchange rate is an appreciation. Output, consumption, exports and private imports are expressed as multipliers for Malawi as a whole. Real exchange rate is expressed as a percentage deviation from the steady state. ROW bond holdings are expressed as deviations from their steady-state value, normalized by steady-state GDP. Variables plotted for a shock of 100% of treated region GDP.

under restricted capital mobility, so exports fall by a smaller amount, reducing the strength of the negative spillover mechanism. Consequently, the positive demand spillover mechanism dominates, yielding a positive spillover multiplier (0.48) and larger aggregate multiplier of 1.56.

Fixing the nominal exchange rate on top of unrestricted capital mobility (green bars) further reduces real exchange rate movement to close to zero (given sticky prices). Consequently, the fall in exports is small, almost removing the negative spillover effect and leading to a large positive spillover multiplier of about 0.95. The aggregate output multiplier rises to 2.03, almost twice as large as the local output multiplier. Consumption increases the most among the three cases.

The main takeaway from this analysis is that local multipliers, as estimated in an RCT, are a poor guide to aggregate multipliers which depend crucially on the macroeconomic environment: the aggregate output multiplier can be smaller than the local multiplier under restricted capital mobility as in Malawi, but can be much larger than the local multiplier under unrestricted capital mobility, particularly when the nominal exchange rate is fixed.

8. Robustness and Extensions

This section presents several robustness exercises and extensions. First, we examine how scaling up transfers changes the local and aggregate multipliers in an economy with relatively open international capital markets, such as Kenya. Second, we examine the robustness of our results to alternative measures of home bias in the treated region and compare our model results with the empirical estimates from Kenyan villages in [Egger et al. \(2022\)](#). Third, we consider an alternative monetary and fiscal arrangement. Finally, we summarize additional robustness checks incorporating intermediate inputs in production, as well as results for dynamic multipliers, with details presented in [Appendix D.2](#) and [Appendix D.3](#).

8.1. *Scaling up transfers under unrestricted capital mobility*

As plotted in [Appendix Figure B8](#), scaling up cash transfers in an economy with unrestricted capital flows and a flexible exchange rate still lowers local and aggregate multipliers, although they remain positive. This decline reflects the falling share of hand-to-mouth households as the program scales, which weakens the demand channel. With a fixed exchange rate and unrestricted capital flows, the aggregate multiplier continues to fall as the program scales, though the local multiplier is broadly constant (red dashed line).

Although the multipliers themselves fall, the total transfer amount grows faster with the scale of the program, so the effect on aggregate output rises rapidly in economies with unrestricted capital flows. At $n = 0.15$, a transfer of about 10% of national GDP increases first-year GDP growth by about 14 percentage points under a flexible exchange rate and 18 percentage points under a fixed exchange rate, compared with around 2.8 percentage points under restricted capital mobility. Note that with such large transfers, the economy is no longer close to steady state, and so nonlinearities not captured by our solution method may become more important quantitatively.

8.2. *Home bias*

Since home bias is an important parameter for the local multiplier, we consider two adjustments to our baseline home-bias estimate, which move in opposite directions and are mostly offsetting (see [Appendix A](#) for details).

First, our baseline assumes full home bias for home-produced food. Adjusting for agricultural inputs sourced from outside the household’s Traditional Authority, such as fertilizer and pesticides, reduces overall home bias from 0.57 to 0.54 and lowers the local multiplier from 1.08 to 0.96.

Second, our baseline defines “home” as the household’s own Traditional Authority. By contrast, [Egger et al. \(2022\)](#) define “local” as the entire study area, Siaya county in Kenya, which is much larger. If instead we defined “home” as the entire Chiradzulu district, home bias increases from 0.57 to 0.61, with the corresponding local multiplier increasing from 1.08 to 1.26.

8.3. Reconciling estimates with [Egger et al. \(2022\)](#)

This subsection reconciles our local multiplier of 1.08 with the 2.58 estimated for Kenya by [Egger et al. \(2022\)](#). One important source of the difference is home bias. [Egger et al. \(2022\)](#) estimate that Siaya county has home bias of 0.75, which is much higher than our estimate of 0.57 for Chiradzulu. If we apply their home bias estimate of 0.75 in our model, the local multiplier increases to 2.33, which is similar to their estimate.

There are additional differences. First, our model abstracts from investment and inventory responses, which contribute 0.55 to their estimate in their setting. Second, as noted in [Egger et al. \(2022\)](#), it is hard to measure imports from outside the treated area in their surveys, so imports might be understated, which would overstate their multiplier. In fact, the consumption multiplier is approximately 2 in both the Kenyan RCT and our model, but in their baseline net exports are unchanged, whereas in our model net exports subtract 0.92. The New Keynesian model predicts that if the transfer is spent and relative prices are almost constant, the net export multiplier must be close to -1 so that net spending on foreign goods equals the size of the transfer.²¹ Finally, we report the impact multiplier in the first year, whereas [Egger et al. \(2022\)](#)’s estimates cover a 27-month period. Over the first year, [Egger et al. \(2022\)](#) find an expenditure multiplier of about 1.5, not far from our 1.08.

8.4. Alternative Monetary and Fiscal Arrangements

First, we consider two alternative parallel exchange rate setups. Instead of having a managed crawl for the official rate, the government could have a fixed USD budget for essential imports and adjust the implicit tax to fund that target, which is closer to the treatment in [Pinto \(1991\)](#). In this case, the aggregate multiplier is higher by 0.14 as incoming GiveDirectly transfers lead to a greater decline in the implicit export tax, whereas in our baseline, the transfers also lead to higher government imports. Alternatively, exporters have to surrender only 30% of export earnings at the

²¹[Egger et al. \(2022\)](#) include an extension which interpolates data on import adjustment, which results in a net export multiplier of -0.53 , moving our estimates closer together.

official rate according to the recent mandate by the Reserve Bank of Malawi, although GiveDirectly has to surrender 100%. This setting undoes almost all the gains to the aggregate multiplier from a parallel rate.²²

Finally, we consider a fiscal-dominance extension based on [Leeper \(1991\)](#). Details are presented in [Appendix D.1](#). In this case, monetary policy responds passively to inflation, with a less-than-proportional nominal interest-rate response, while lump-sum taxes do not adjust to stabilize local-currency government debt. Perhaps surprisingly, this generates similar aggregate multipliers to those under the smoothed Taylor rule in our baseline, where monetary policy is active. The limited change in the aggregate multiplier relative to our baseline reflects, in part, that the cash transfer is funded by GiveDirectly rather than government borrowing. Therefore, it creates no direct government financing requirement, avoiding the unbacked-deficit channel commonly emphasized in the fiscal dominance literature.²³

8.5. *Intermediates, Dynamics, Indexation*

We report three further exercises in the appendix. First, adding imported intermediate inputs, such as fuel and fertilizer, to production in both sectors reduces local and aggregate value-added multipliers under our calibration, as the increased reliance on imported inputs more than offsets the expansionary effect of reducing consumption imports ([Appendix D.2](#)). Second, the effects of the one-time transfer beyond the first year differ across treated and control regions ([Appendix Figure B9](#)). Third, in [Appendix D.4](#) we replace national inflation indexation with own-region indexation, or with standard Calvo pricing without indexation calibrated to match first-year multipliers. Impact-year multipliers are robust to the pricing formulation: in every macro-policy regime, first-year aggregate multipliers differ by at most 0.1 across the three specifications, as displayed in [Appendix Table D2](#), though medium-run cumulative multipliers can be sensitive to the indexation scheme.

²²We note that we abstract from other uses of government USD revenues, such as an import subsidy or reserve accumulation, which we leave for future work.

²³In addition, the same wealthier Ricardian households that hold MWK-denominated government debt *also* pay the lump-sum taxes to service it, so debt repayments, new bond purchases, and tax payments cancel when their budget constraints are consolidated with the government budget constraint. We note that our extension abstracts from distortionary taxes, government spending that responds to debt, and foreign ownership of government debt.

9. Conclusion

This paper develops a two-region New Keynesian small open economy model to study the local and aggregate effects of one-time cash transfers in developing countries. We exploit rich microdata from GiveDirectly’s ongoing RCT in Malawi to calibrate the model’s key parameters. Our model predicts a local GDP multiplier of 1.08 with little first-year inflation. At the national level, the aggregate multiplier is less than the local multiplier, and both fall as the program scales up. The negative spillovers to control regions are mostly due to Malawi’s macroeconomic policy environment, especially restricted capital mobility. Under alternative macro-policy regimes—especially unrestricted capital mobility—spillovers can instead be positive.

Taken together, our analysis suggests that cash transfers can substantially boost short-run GDP in subnational regions receiving them, but their aggregate effects depend critically on the broader macroeconomic environment. While local multiplier estimates are robust to the macro-policy environment, they depend on the share of hand-to-mouth households, price rigidities, and home bias and so are not necessarily portable across countries or regions if these features differ. Importantly, as programs scale up, external-sector adjustment becomes increasingly important for determining their aggregate effects.

We conclude with some possible extensions that may be relevant to developing countries, in general and Malawi, in particular. First, it would be interesting to incorporate central bank reserve accumulation, especially in the context of parallel exchange rates (see [Berg et al. \(2015\)](#)). If the central bank were able to step up foreign exchange reserve purchases, this might offset the exchange rate appreciation simulated in the baseline. Second, our model abstracts from economic slack, potentially biasing the multiplier downward. An unexplored area is how slack interacts with the macro-policy environment. A third extension is to model Malawian agriculture explicitly. The sector accounts for one-third of GDP and two-thirds of employment, and the agricultural cycle might limit the ability of firms to boost output in the short term in response to a transfer, biasing the multiplier upward.

Disclaimer: The authors used AI-assisted tools (Claude and Codex) to support research activities, including coding some data analysis, developing and debugging code for model extensions, checking model implementation and consistency, generating selected figures, and drafting portions of the appendix. All code, analysis, results, and manuscript content were reviewed and verified by the authors, who take full responsibility for the final work.

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Appendix A. Home Bias Calibration

We estimate Traditional-Authority-level home bias separately for Southern and Northern Chiradzulu, using the Phase I and Phase II household surveys together with the enterprise survey, which is common to both estimates. The estimates are very similar—0.56 in the South and 0.58 in the North—despite large differences in income levels and expenditure composition across the two samples. We therefore calibrate home bias to 0.57, the midpoint of the two estimates.

Definitions. Home bias is computed at the household level. For household i , home bias is defined as the fraction of total expenditure that generates income within the household’s Traditional Authority (TA). Specifically,

$$HB_i = \sum_s \sum_\ell \lambda_{s,\ell}^i LC_{s,\ell}, \quad (\text{A.1})$$

where s indexes sectors, ℓ indexes spending locations, and $\lambda_{s,\ell}^i$ is the share of household i ’s total expenditure in sector s at location ℓ . The term $LC_{s,\ell}$ denotes the local content of spending in sector s at location ℓ , defined as:

$$LC_{s,\ell} = \pi_{s,\ell} (1 - \gamma_s^F), \quad (\text{A.2})$$

where $\pi_{s,\ell}$ is the *residency share*: the probability that a seller in sector s at location ℓ resides within the household’s TA. The parameter γ_s^F is the imported intermediate input share in revenues in sector s . Hence, $1 - \gamma_s^F$ is the *local revenue share*: the average fraction of sector- s revenue that accrues locally through labor income, profits, or TA-sourced inputs. For simplicity, we treat locally sourced inputs as fully local, abstracting from the imported inputs used in their production.

The aggregate (district-level) home bias is the expenditure-weighted average of household-level home bias, where household survey weights make the average representative of the district. Given that $LC_{s,\ell}$ does not vary across households, the aggregate home bias can be written equivalently as a sector-location decomposition:

$$HB = \sum_s \sum_\ell \Lambda_{s,\ell} \pi_{s,\ell} (1 - \gamma_s^F), \quad (\text{A.3})$$

where $\Lambda_{s,\ell}$ is the aggregate household expenditure share in sector s at location ℓ . The decomposition is useful to understand what drives home bias in Malawi.

Results. Table A1 reports the decomposition in equation (A.3) for Southern Chiradzulu (Phase I). Three features drive the results. First, home production accounts for 19% of total expenditure and enters with full local content ($\pi = 1$ and $1 - \gamma^F = 1$). Second, most purchased

spending occurs within villages or in markets in the same TA, where residency shares are high, while direct expenditure leakages to Blantyre or outside Chiradzulu are small. Third, local revenue shares are substantially lower for food and non-food goods ($1 - \gamma^F \approx 0.50$) than for services (0.76). Together, these forces yield an aggregate home bias of 0.56 in Southern Chiradzulu. This moderate value reflects the fact that, although consumption is highly local, a large share of food and non-food revenues leaks out through imported intermediate inputs.

Applying the same calculation using expenditure shares from the Northern Chiradzulu data, we obtain an aggregate home bias of 0.58. Despite substantial differences in income and spending patterns between the two regions, their effects roughly offset one another, yielding similar aggregate estimates. Our baseline calibration is 0.57, the midpoint of the Northern and Southern estimates.

Table A1: **Home bias by location and sector: share per MWK of total consumption**
Southern Chiradzulu (Phase I)

Location	Food				Non-food				Services			
	Λ	π	$1 - \gamma^F$	HB	Λ	π	$1 - \gamma^F$	HB	Λ	π	$1 - \gamma^F$	HB
Home production	.19	1	1	.19	—	—	—	—	—	—	—	—
Own village	.14	1	.48	.07	.08	1	.50	.04	.22	1	.76	.17
Other village	.03	1	.48	.01	.01	1	.50	.00	.01	1	.76	.01
Market, same TA	.10	.99	.48	.05	.04	.55	.50	.01	.02	.87	.76	.01
Market, different TA	.02	0	—	—	.01	0	—	—	.00	0	—	—
Blantyre	.02	0	—	—	.03	0	—	—	.01	0	—	—
Outside Chiradzulu	.03	0	—	—	.03	0	—	—	.03	0	—	—
Sum	.53			.32	.18			.05	.29			.19
Home bias, South (Phase I)												.56
Home bias, North (Phase II) – details available upon request												.58
Baseline calibration (average of Phases I and II)												.57

Notes. Food comprises purchases, own-produced food, and gifts. Non-food comprises durable and semi-durable goods, such as clothing and household items. Services covers all remaining expenditure categories, including transport, utilities, rents, etc. Local revenue shares ($1 - \gamma_s^F$) are computed by decomposing enterprise revenue into labor costs, profits, and input costs. Input costs are then allocated geographically using qualitative enterprise survey responses indicating whether a firm sources inputs from each of seven locations (four local and three outside Chiradzulu). Residency shares ($\pi_{s,\ell}$) are computed using enterprise survey data on each enterprise’s market location and its owner’s TA of residence.

Alternative geographic definition: Chiradzulu district as home. The baseline defines “home” as the household’s own TA, whereas Egger et al. (2022) define “local” as their entire study area (Siaya county), a much larger unit. We, therefore, compute home bias defining “home” as the entire Chiradzulu district (10 TAs). Under this definition, we set $\pi = 1$ for purchases at markets throughout the district, since virtually all enterprise owners in the survey reside in Chiradzulu.²⁴

²⁴The imported-intermediate share γ_s^F is unchanged because the survey does not provide sufficient information to distinguish input sources across TAs. Therefore, the baseline already measures this share at the district level, classifying inputs sourced within Chiradzulu as local and those sourced outside the district as imported.

The resulting increase is modest in the South (0.59), since only about 20% of spending occurs at markets, and larger in the North (0.63), where different-TA market food purchases are more important. The midpoint under the district definition is 0.61.

Imported intermediates in home production. The baseline assigns $1 - \gamma^F = 1$ to home-produced food. This is optimistic, since farming uses some imported inputs—particularly fertilizer and pesticides. Using the household baseline survey, which records agricultural input expenditures, we classify fertilizer and pesticides as imported and seeds, tools, and other inputs as local. Imported inputs account for 20% of home-produced food value in the South and 10% in the North. Home bias falls from 0.56 to 0.52 in the South and from 0.58 to 0.55 in the North, with a midpoint of 0.54.

Appendix B. Additional Figures and Tables

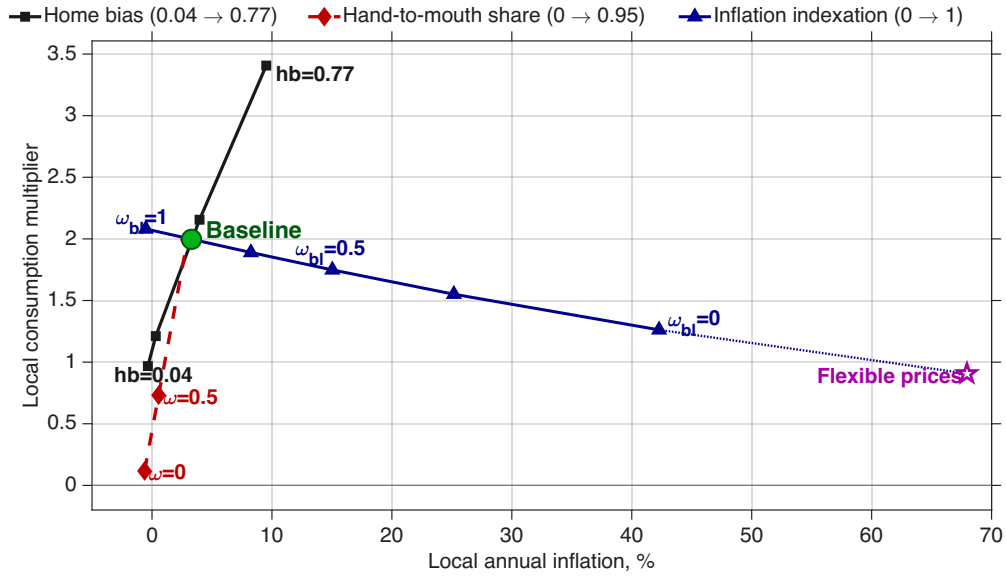


Figure B1: Local *consumption* multiplier versus local inflation across parameterizations

Notes: The figure plots the local consumption multiplier against local inflation in the first year across alternative model parameterizations. Each point corresponds to a different combination of the hand-to-mouth share, price stickiness, and home bias. The baseline calibration yields a consumption multiplier of 2. The baseline multiplier (green circle) is computed with the baseline calibration: $\alpha_C = 0.43$, implying a $hb = 0.57$, $\omega = 0.95$, $\omega_{bl} = 0.8$, and $\theta_P = 0.0625$. The parameter grid varies home bias from 0.04 to 0.77 (black sweep with square markers), the hand-to-mouth share from 0 to 0.95 (red sweep with diamond markers), and inflation indexation from 0 to 1 (blue sweep with triangle markers). The flexible-price (purple star) case sets $\theta_P = 0$ and $\omega_{bl} = 0$.

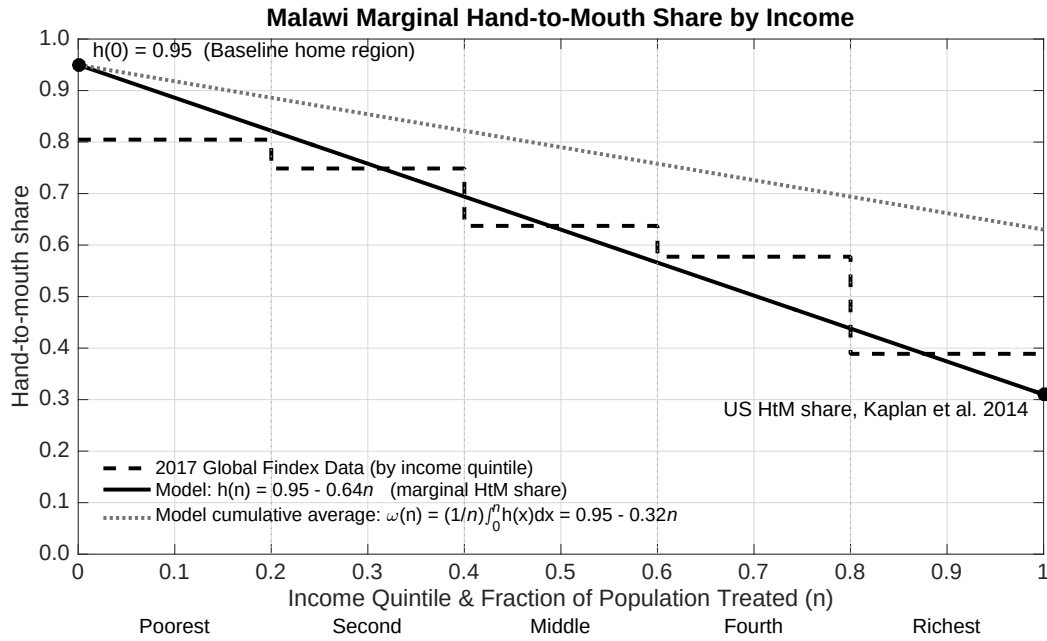


Figure B2: Marginal hand-to-mouth share by income in Malawi. Step function: the 2017 Global Findex data by income quintile. Solid line: linear marginal density $h(n) = 0.95 - 0.64n$ used in the model. Dotted line: implied cumulative average $\omega(n) = (1/n) \int_0^n h(x) dx = 0.95 - 0.32n$.

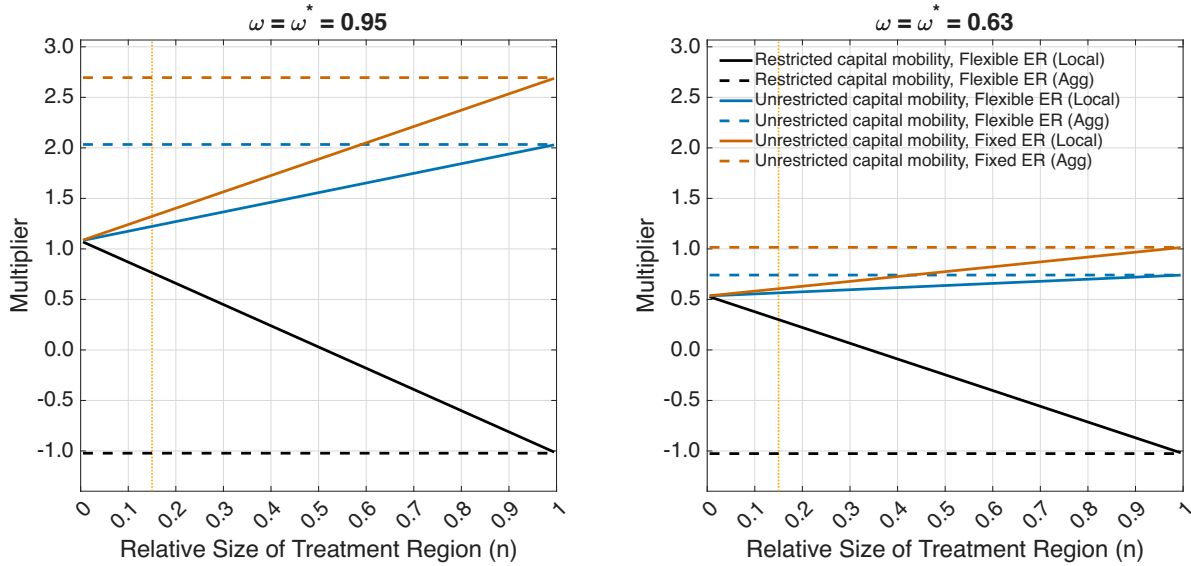


Figure B3: Local and aggregate output multipliers as the treated region scales up, under symmetric hand-to-mouth (HtM) shares ($\omega = \omega^*$)

Notes: Each panel plots the local (solid) and aggregate (dashed) output multipliers of cash transfers, as a function of the relative size of the treated region n , for three policy regimes: restricted capital mobility with flexible exchange rate (black), unrestricted capital mobility with flexible exchange rate (blue), and unrestricted capital mobility with fixed exchange rate (orange). The left panel sets the hand-to-mouth share in both the treated and control regions to $\omega = \omega^* = 0.95$; the right panel sets both to the national average $\omega = \omega^* = 0.63$. The orange dotted vertical line marks the hypothetical treated share $n = 0.15$.

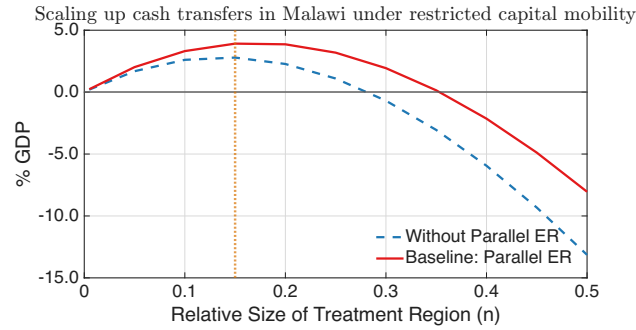


Figure B4: Scaling up cash transfers in terms of national GDP growth

Notes: We compute the percentage change in Malawi GDP as the size of the cash transfer program goes up. The orange dotted vertical line marks the hypothetical treated share $n = 0.15$.

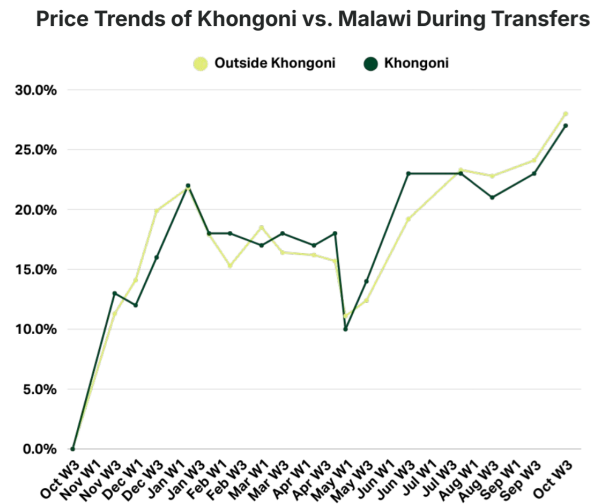


Figure B5: Price trends in response to one-time transfers in Khongoni subdistrict from [Egger et al. \(2025\)](#)

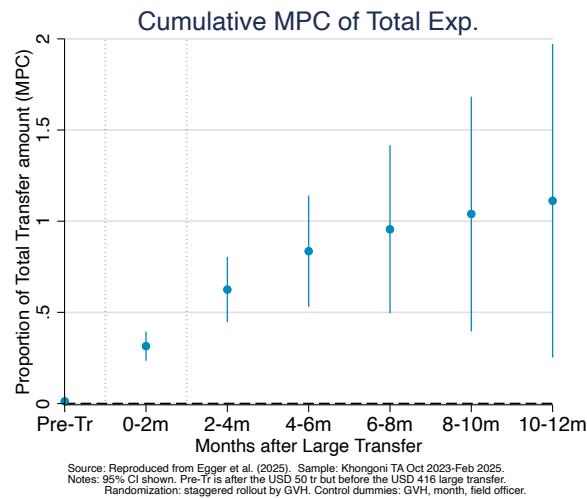


Figure B6: MPC to spend one-time transfers in Khongoni subdistrict from [Egger et al. \(2025\)](#)

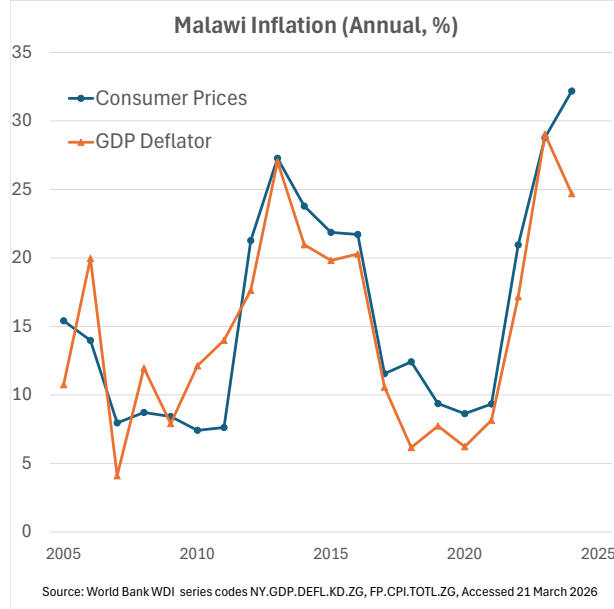


Figure B7: Inflation in Malawi

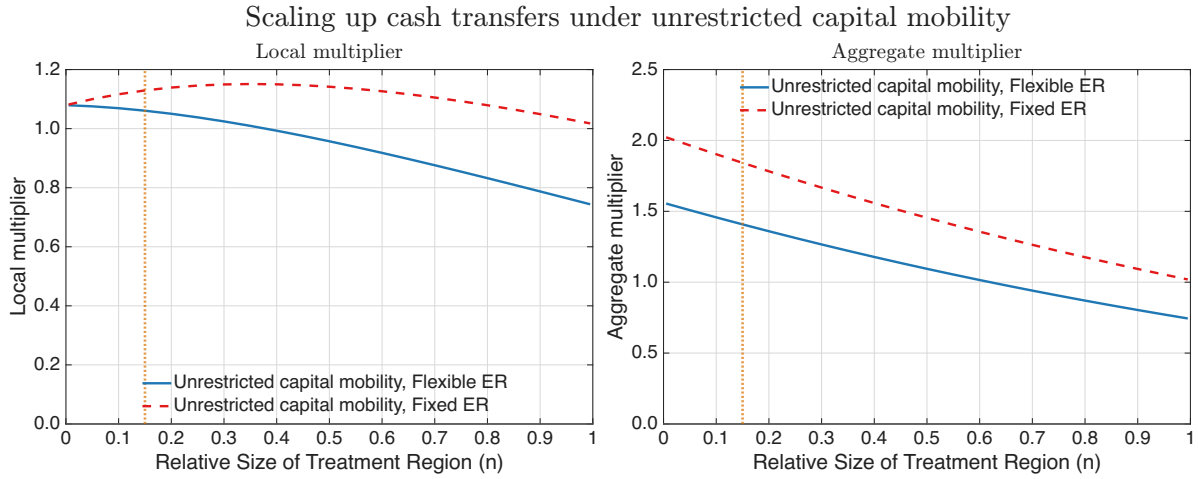


Figure B8: Scaling up cash transfers with unrestricted capital mobility: local and aggregate output multipliers

Notes: The figure plots the local (left) and aggregate (right) output multipliers of an unconditional cash transfer as a function of the relative size of the treated region n , for two policy regimes in the open economy: a fixed ER (red) and a floating exchange rate (blue). As the treated region scales up, the treated-region hand-to-mouth share ω and the control-region share ω^* vary with n according to the linear rule $\omega(n) = 0.95 - 0.32n$ and $\omega^*(n) = 0.63 - 0.32n$, so that the population-weighted national hand-to-mouth average is held fixed at the national value of 0.63 for all n (i.e. $n\omega + (1 - n)\omega^* = 0.63$). The orange dotted vertical line marks $n = 0.15$.

Appendix C. Local Multiplier Propositions and Proofs

Note: The proposition and proof approach here follows that in the Appendix of [Pennings \(2021\)](#), but for a slightly more general model with decreasing returns to scale production and an external sector.

Assumptions

Common assumptions.

A1. *No non-tradable sector* $\alpha_C = \alpha_C^* = 1$

A2. *Small treated region:* $n \rightarrow 0$

A3. *One-time transfer:* unanticipated and equal per person at $t = 0$, with $\widehat{TR}_t = 0$ for $t \geq 1$

A4. *Separable log preferences* $\sigma = \gamma_u = 1$

A5. *No indexation:* $\omega_{bl} = 0$.

A6. *No parallel exchange rate* $\mu_{ss} = \rho_{eo} = 0$

Specific to Propositions 1a, 1b. (rigid prices with hand-to-mouth households):

A7. *Rigid prices:* $\theta_P = 1$

A8. *Common labor allocation* (labor-union convention): $\widehat{L}_t^R = \widehat{L}_t^N$ for all t , with wages set based on Ricardian FOC.

Specific to Proposition 2. (flexible prices and no HtM):

A9. *Flexible prices:* $\theta_P = 0$

A10. *No hand-to-mouth households:* $\omega = \omega^* = 0$. (All households are Ricardian.)

Here $\widehat{P}_{h,t}^T$ is the producer price relative to the local CPI. Hats denote log deviations, except that transfers and bond payoffs are level deviations in steady-state GDP units per resident.²⁵ We consider the regular small-region response to this shock, with no uncertainty after impact and no

²⁵Maintain constant productivity, constant discounting, balanced steady-state trade and zero steady-state assets. Transfers and ownership of firm and union profits are equal per person. Wages are flexible in both regimes, so the Ricardian labor-leisure condition holds for the wage paid by firms. Domestic saving is frictionless; foreign saving, if permitted, is also frictionless (otherwise $\widehat{B}_{w,t} = 0$). Steady-state consumption and output are equal and normalized to one. The parameter domain is $0 < \beta < 1$, $0 < \alpha_L \leq 1$, $\psi \geq 0$, $0 \leq \omega < 1$, $0 < \alpha_h^T < 1$, $\alpha_f^T, \alpha_w^T \geq 0$, $\alpha_h^T + \alpha_f^T + \alpha_w^T = 1$, $\theta_T, \theta_T^{rw} \geq 1$, and $\epsilon_Y > 1$.

independent outside shocks. Outside spending, nominal prices, exchange rates and interest rates are unchanged.²⁶

Simplified Model. Under Assumptions A1–A6 and either A7–A8 or A9–A10, together with the conditions above, the full model reduces to:

$$\widehat{C}_t = (1 - \omega)\widehat{C}_t^R + \omega\widehat{C}_t^N \quad \text{Aggregate cons.} \quad (\text{C.1})$$

$$\widehat{C}_t^N = \widehat{Y}_t + \widehat{P}_{h,t}^T + \widehat{TR}_t \quad \text{HtM cons.} \quad (\text{C.2})$$

$$\widehat{C}_t^R = \widehat{C}_{t+1}^R - \widehat{R}_t + \widehat{\pi}_{t+1} \quad \text{Ric. Euler} \quad (\text{C.3})$$

$$\widehat{C}_t^R + \beta(\widehat{B}_{t+1} + \widehat{B}_{w,t+1}) = \widehat{B}_t + \widehat{B}_{w,t} + \widehat{Y}_t + \widehat{P}_{h,t}^T + \widehat{TR}_t \quad \text{Ric. budget} \quad (\text{C.4})$$

$$\widehat{Y}_t = \alpha_L \widehat{L}_t \quad \text{GDP} \quad (\text{C.5})$$

$$\widehat{Y}_t = \alpha_h^T \widehat{C}_t - \frac{\theta_T \alpha_h^T (1 - \alpha_h^T) + \theta_T \alpha_f^T + \theta_T^w \alpha_w^T}{1 - \alpha_h^T} \widehat{P}_{h,t}^T \quad \text{Goods demand} \quad (\text{C.6})$$

$$\widehat{MC}_t^T = \widehat{W}_t + (1 - \alpha_L) \widehat{L}_t \quad \text{Marginal cost} \quad (\text{C.7})$$

$$\widehat{W}_t = \widehat{C}_t^R + \psi \widehat{L}_t^R \quad \text{Labor-leisure} \quad (\text{C.8})$$

$$\widehat{L}_t = (1 - \omega) \widehat{L}_t^R + \omega \widehat{L}_t^N \quad \text{Aggregate hours} \quad (\text{C.9})$$

$$\widehat{\pi}_t = \alpha_h^T \widehat{\pi}_{h,t}^T \quad \text{CPI inflation} \quad (\text{C.10})$$

$$\widehat{\pi}_{h,t}^T = \frac{\widehat{P}_{h,t}^T - \widehat{P}_{h,t-1}^T}{1 - \alpha_h^T} \quad \text{Producer inflation} \quad (\text{C.11})$$

$$\theta_P^T (\widehat{\pi}_{h,t}^T - \beta \widehat{\pi}_{h,t+1}^T) = \frac{(1 - \theta_P)(1 - \beta \theta_P)}{1 + (1 - \alpha_L) \epsilon_Y / \alpha_L} (\widehat{MC}_t^T - \widehat{P}_{h,t}^T) \quad \text{Price Phillips curve} \quad (\text{C.12})$$

Zero responses in the regular small-region limit.

$$\widehat{R}_t = \widehat{R}_t^{rw} = 0 \quad \text{Interest rates} \quad (\text{C.13})$$

$$\widehat{ex}_t = \widehat{ex}_t^O = \widehat{ex}_{gr,t} = 0 \quad \text{Nominal exchange rates} \quad (\text{C.14})$$

$$\widehat{Y}_t^* = \widehat{C}_t^* = \widehat{L}_t^* = 0 \quad \text{Control quantities} \quad (\text{C.15})$$

$$\widehat{P}_{f,t}^{T*} = \widehat{\pi}_{f,t}^{T*} = \widehat{\pi}_t^* = 0 \quad \text{Control prices} \quad (\text{C.16})$$

$$\widehat{Y}_t^{Agg} = \widehat{C}_t^{Agg} = \widehat{\pi}_t^{Agg} = 0 \quad \text{National aggregates} \quad (\text{C.17})$$

²⁶Initial conditions are $\widehat{B}_0 = \widehat{B}_{w,0} = \widehat{P}_{h,-1}^T = 0$, and the terminal condition is $\lim_{T \rightarrow \infty} \beta^{T+1} (\widehat{B}_{T+1} + \widehat{B}_{w,T+1}) = 0$.

Propositions 1a, 1b: rigid-price restrictions.

$$\theta_P = 1 \quad \text{Rigid prices} \quad (\text{C.18})$$

$$\widehat{L}_t^R = \widehat{L}_t^N = \widehat{L}_t \quad \text{Equal hours} \quad (\text{C.19})$$

Proposition 2: omit equation (C.2) and impose flexible prices and no HtM.

$$\theta_P = 0 \quad \text{Flexible prices} \quad (\text{C.20})$$

$$\omega = \omega^* = 0 \quad \text{No HtM} \quad (\text{C.21})$$

Statements

Proposition 1 (Rigid P, with HtM, general β). *Under Assumptions A1–A8, the conditions above and $\beta R_{ss}^* = 1$, the impact local multiplier of a one-time cash transfer of magnitude $\widehat{TR}_0$ is*

$$\frac{d\widehat{Y}_0}{d\widehat{TR}_0} = \frac{\alpha_h^T [(1 - \beta) + \omega (\beta - \alpha_h^T)]}{(1 - \alpha_h^T)(1 - \alpha_h^T \omega)}. \quad (\text{C.22})$$

Additionally if $\beta \rightarrow 1$, the impact local multiplier simplifies to

$$\lim_{\beta \uparrow 1} \frac{d\widehat{Y}_0}{d\widehat{TR}_0} = \frac{\omega \alpha_h^T}{1 - \alpha_h^T \omega}. \quad (\text{C.23})$$

Proposition 2 (Flex Prices, no HtM). *Under Assumptions A1–A6, A9, A10, the conditions above and $\beta R_{ss}^* = 1$, the impact local multiplier of a one-time cash transfer of magnitude $\widehat{TR}_0$ is*

$$\frac{d\widehat{Y}_0}{d\widehat{TR}_0} = -\frac{\alpha_L (1 - \beta)}{1 + \psi}. \quad (\text{C.24})$$

Proof of Propositions 1a and 1b. Under (C.18), the price Phillips curve (C.12) gives $\widehat{\pi}_{h,t}^T = \beta \widehat{\pi}_{h,t+1}^T$. Bounded inflation therefore implies zero producer inflation. Equation (C.11) and the initial price condition then imply $\widehat{P}_{h,t}^T = 0$, and (C.10) gives zero CPI inflation. The Euler equation (C.3), using (C.13), makes Ricardian consumption constant:

$$\widehat{C}_t^R = \widehat{C}_0^R. \quad (\text{C.25})$$

With $\widehat{P}_{h,t}^T = 0$ equation (C.6) then reduces to

$$\widehat{Y}_t = \alpha_h^T \widehat{C}_t. \quad (\text{C.26})$$

Combining this with (C.1) and (C.2) gives

$$(1 - \omega\alpha_h^T)\widehat{Y}_0 = \alpha_h^T[(1 - \omega)\widehat{C}_0^R + \omega\widehat{TR}_0]. \quad (\text{C.27})$$

$$(1 - \omega\alpha_h^T)\widehat{Y}_\infty = \alpha_h^T(1 - \omega)\widehat{C}_0^R. \quad (\text{C.28})$$

As the transfer is only for the first period $\widehat{Y}_\infty$ is the constant output response for every $t \geq 1$, after the transfer has ended. Discounting (C.4) and using zero initial assets and the discounted terminal asset condition yields

$$\widehat{C}_0^R = (1 - \beta)(\widehat{Y}_0 + \widehat{TR}_0) + \beta\widehat{Y}_\infty. \quad (\text{C.29})$$

To solve these three equations, substitute $\widehat{Y}_0$ from (C.27) and $\widehat{Y}_\infty$ from (C.28) into (C.29). Since $(1 - \beta) + \beta = 1$, the two terms involving Ricardian consumption combine to give

$$\widehat{C}_0^R = \frac{\alpha_h^T(1 - \omega)}{1 - \omega\alpha_h^T}\widehat{C}_0^R + (1 - \beta)\left(1 + \frac{\omega\alpha_h^T}{1 - \omega\alpha_h^T}\right)\widehat{TR}_0.$$

The expression in parentheses is $1/(1 - \omega\alpha_h^T)$. Multiplying through by $1 - \omega\alpha_h^T$ and collecting the consumption terms on the left yields

$$[1 - \omega\alpha_h^T - \alpha_h^T(1 - \omega)]\widehat{C}_0^R = (1 - \beta)\widehat{TR}_0.$$

The coefficient in brackets simplifies to $1 - \alpha_h^T$. Dividing by this positive coefficient gives

$$\widehat{C}_0^R = \frac{1 - \beta}{1 - \alpha_h^T}\widehat{TR}_0. \quad (\text{C.30})$$

Substituting into (C.27) and dividing by the transfer proves (C.22). Taking $\beta \uparrow 1$ gives (C.23). $\square$

Proof of Proposition 2. Equations (C.21), (C.1) and (C.9) give $\widehat{C}_t^R = \widehat{C}_t$ and $\widehat{L}_t^R = \widehat{L}_t$. Under (C.20), the price Phillips curve (C.12) implies $\widehat{MC}_t^T = \widehat{P}_{h,t}^T$. Substituting the labor-leisure condition (C.8) into (C.7) therefore gives

$$\widehat{P}_{h,t}^T = \widehat{C}_t + (1 + \psi - \alpha_L)\widehat{L}_t. \quad (\text{C.31})$$

Using (C.5) therefore gives

$$\widehat{C}_t - \widehat{P}_{h,t}^T = -\frac{1 + \psi - \alpha_L}{\alpha_L}\widehat{Y}_t. \quad (\text{C.32})$$

Using zero interest-rate responses (C.13) and the inflation identities (C.10)–(C.11), the Euler equation (C.3) implies that, for every $t \geq 0$,

$$\widehat{C}_t + \frac{\alpha_h^T}{1 - \alpha_h^T} \widehat{P}_{h,t}^T = \widehat{C}_{t+1} + \frac{\alpha_h^T}{1 - \alpha_h^T} \widehat{P}_{h,t+1}^T. \quad (\text{C.33})$$

Thus this combination of consumption and the relative producer price is constant from impact onward. To eliminate consumption, substitute (C.32) at dates t and $t + 1$ into (C.33). Since $1 + \alpha_h^T/(1 - \alpha_h^T) = 1/(1 - \alpha_h^T)$, this gives

$$\frac{\widehat{P}_{h,t}^T}{1 - \alpha_h^T} - \frac{1 + \psi - \alpha_L}{\alpha_L} \widehat{Y}_t = \frac{\widehat{P}_{h,t+1}^T}{1 - \alpha_h^T} - \frac{1 + \psi - \alpha_L}{\alpha_L} \widehat{Y}_{t+1}. \quad (\text{C.34})$$

Next, substitute (C.32) into goods demand (C.6) at date t . Collecting output terms and solving for the relative producer price gives the contemporaneous relation

$$\frac{\widehat{P}_{h,t}^T}{1 - \alpha_h^T} = - \frac{1 + \alpha_h^T(1 + \psi - \alpha_L)/\alpha_L}{(\theta_T - 1)\alpha_h^T(1 - \alpha_h^T) + \theta_T\alpha_f^T + \theta_T^{rw}\alpha_w^T} \widehat{Y}_t. \quad (\text{C.35})$$

Substitute (C.35) at dates t and $t + 1$ into (C.34), then multiply through by this denominator, which is positive under the stated trade-elasticity bounds and $\alpha_f^T + \alpha_w^T = 1 - \alpha_h^T > 0$. Using $\alpha_h^T + (\theta_T - 1)\alpha_h^T(1 - \alpha_h^T) = (\alpha_h^T)^2 + \theta_T\alpha_h^T(1 - \alpha_h^T)$ to collect terms yields

$$\left[1 + \frac{1 + \psi - \alpha_L}{\alpha_L} \{ (\alpha_h^T)^2 + \theta_T\alpha_h^T(1 - \alpha_h^T) + \theta_T\alpha_f^T + \theta_T^{rw}\alpha_w^T \} \right] (\widehat{Y}_{t+1} - \widehat{Y}_t) = 0. \quad (\text{C.36})$$

The term in brackets is at least one, since $(1 + \psi - \alpha_L)/\alpha_L \geq 0$. Hence output is constant from impact onward. Equation (C.35) implies relative prices are constant, and equation (C.32) then implies constant consumption.

Dropping time subscripts for these constant responses, solving forward (C.4) using zero initial assets, the discounted terminal asset condition and the one-time transfer implies

$$\frac{1}{1 - \beta} \widehat{C} = \frac{1}{1 - \beta} \widehat{P}_h^T + \frac{1}{1 - \beta} \widehat{Y} + \widehat{TR}_0. \quad (\text{C.37})$$

The supply relation (C.32) gives

$$\widehat{C} - \widehat{P}_h^T = - \frac{1 + \psi - \alpha_L}{\alpha_L} \widehat{Y}. \quad (\text{C.38})$$

Combining the last two equations yields

$$\frac{1 + \psi}{\alpha_L} \widehat{Y} = -(1 - \beta) \widehat{TR}_0, \quad (\text{C.39})$$

Dividing by the transfer proves equation (C.24). $\square$

Appendix D. Further Robustness and Extensions

Appendix D.1. Fiscal Dominance Extension

This appendix adds a simple fiscal-dominance extension based on [Leeper \(1991\)](#) to investigate how it affects the GiveDirectly transfer multiplier, both with and without a parallel exchange rate. Throughout we continue to assume restricted capital mobility and that domestic government debt denominated in MWK is held by local Ricardian households. Only Ricardian households hold government debt and pay the lump-sum taxes used to service it, because they are the richer household type and the rest of the population does not have access to financial markets.

Although the model features an alternative Passive Monetary-Active Fiscal (PM/AF) regime as in [Leeper \(1991\)](#), it has little effect on local transfer multipliers and generates aggregate multipliers close to those under the baseline smoothed Active Monetary-Passive Fiscal (AM/PF) rule. The qualitative result in our baseline that the aggregate multipliers are less than the local multipliers and both fall as the program scales up continues to hold.

The modest difference in aggregate multipliers between the PM/AF regime and our smoothed AM/PF baseline reflects, in part, the external financing of the GiveDirectly transfer. Because the transfer does not require government borrowing, it does not generate the unfunded fiscal expansion commonly considered in the fiscal-dominance literature. In addition, the same wealthier Ricardian households that hold MWK-denominated government debt *also* pay the lump-sum taxes used to service it. Debt repayments, new bond purchases, and tax payments therefore cancel when their budget constraints are consolidated with the government budget constraint. If taxes were distortionary, government spending responded to debt, or foreigners held government debt, these effects might differ.

Model. Let B_t^G denote nominal end-of-period government debt issued during period t and outstanding at the end of the period. It is purchased for B_t^G/R_t . The stock B_{t-1}^G is inherited beginning-of-period debt brought from the end of $t - 1$ into period t . The government levies lump-sum taxes $T_t^{G,R}$ to service the debt. Therefore, the treated region Ricardian household's budget

constraint, equation (2) in the main text, becomes:²⁷

$$P_t C_t^R + \frac{B_t}{R_t} + \frac{B_t^G}{R_t} + T_t^{G,R} = B_{t-1} + B_{t-1}^G + W_t^L L_t^R + N T R_t^R + \Pi_t^R \quad (\text{D.1})$$

Aggregate per capita debt is just a population-weighted average (also adjusting for the fact that the hand-to-mouth households do not hold any debt): $B_{Agg,t}^G = n(1-\omega)B_t^G + (1-n)(1-\omega^*)B_t^{G,*}$.²⁸ The aggregate government budget constraint, using end-of-period debt, is as follows. Lower-case debt and taxes are real quantities measured as shares of steady-state GDP. We assume no net government spending financed by domestic debt. In the parallel exchange rate case, revenue from the exchange rate wedge exactly finances the endogenous dollar waste-import bill, so this balanced account cancels from the consolidated government budget constraint. Thus, inherited debt is revalued by aggregate inflation, while new borrowing is discounted by the current policy rate.

$$\frac{b_{Agg,t}^G}{R_t} + \tau_{Agg,t}^G = \frac{b_{Agg,t-1}^G}{\Pi_t^{Agg}}. \quad (\text{D.2})$$

The baseline fiscal rule adjusts current taxes to inherited debt, where the key parameter here is γ_b , which determines whether fiscal policy is passive (large γ_b) or active (small γ_b):²⁹

$$\tau_{Agg,t}^G - \tau_{Agg,ss}^G = \gamma_b (b_{Agg,t-1}^G - b_{Agg,ss}^G). \quad (\text{D.3})$$

Monetary policy follows a Taylor rule as in equation (20) in the main text, but allows for a small value of ϕ_π in a passive monetary regime.

Appendix D.1.1. *Calibration*

The calibration is the same as that in the main text, with a tradables consumption share of $\alpha_C = 0.43$, implying a non-tradables (home bias) share of 0.57.³⁰ The steady-state debt calibration follows the 2025 IMF Article IV for Malawi, which reports total public debt of about 80 percent of GDP, comprising approximately 50 percent domestic and 30 percent external debt (IMF (2025)).

²⁷This expression suppresses the external borrowing terms in equation (2), which are restricted here. The control region budget constraint is analogous.

²⁸Steady-state debt per Ricardian household is the same across the treated and control regions $B_{ss}^G = B_{ss}^{G,*}$.

²⁹Note that this lump-sum tax is separate from the implicit tax on exports as part of the parallel exchange rate regime. The government has *separate* budget constraints to service domestic steady state debt (in this extension) and to pay for imported government spending (as in the main text with a parallel exchange rate).

³⁰As in the main text, we consider the baseline economy size $n = 0.005$ and the larger-economy robustness $n = 0.15$, retaining $\omega = 0.95$ and $\omega^* = 0.63$ to isolate the impact of fiscal dominance.

Because the model does not include foreign-currency government debt (which is mostly concessionary anyway), local-currency debt is calibrated to the domestic component of 50% GDP, with taxes levied to service it equal to 2% of GDP (as $\beta = 0.96$).

The parallel exchange rate calibration is the same as in the main text: the steady-state premium is $\mu_{ss} = 1.5$, so the gross wedge is $\tau_{ss} = 2.5$. The official rate follows the managed crawl as in equation (24), with $\rho_{eo} = 0.95$, while the parallel rate adjusts flexibly. Setting $\rho_{eo} = 0$ freezes the wedge and reproduces the no-parallel model's responses. The government import bill equals wedge revenues in main text equation (23); these receipts are not counted again as domestic-debt financing.

Policy regimes. Using the monetary-fiscal classification of [Leeper \(1991\)](#), the three policy specifications are:

- **Smoothed AM/PF:** active monetary/passive fiscal policy with $\rho_R = 0.8$, $\phi_\pi = 1.5$, $\phi_Y = 0.5$, and debt-stabilizing taxes $\gamma_b = 0.1$.
- **Simple AM/PF:** the same active monetary/passive fiscal assignment, but with an unsmoothed inflation-only Taylor rule: $\rho_R = 0$, $\phi_\pi = 1.5$, $\phi_Y = 0$, and $\gamma_b = 0.1$.
- **Simple PM/AF:** passive monetary/active fiscal policy with the same unsmoothed inflation-only Taylor-rule structure as simple AM/PF: $\rho_R = 0$, $\phi_\pi = 0.5$, $\phi_Y = 0$, and no debt-stabilizing tax response, $\gamma_b = 0$.

The results below use the same policy comparisons for both exchange rate specifications (Appendix Table D1). In particular, the comparison between simple AM/PF and simple PM/AF holds $\rho_R = 0$ and $\phi_Y = 0$ fixed, changing ϕ_π and γ_b . It therefore measures a joint monetary–fiscal regime change rather than the isolated effect of fiscal feedback.³¹

Appendix D.1.2. No parallel exchange rate

Looping over policy coefficients gives determinacy regions similar to [Leeper \(1991\)](#):

- **Simple AM/PF:** the model is determinate for $\phi_\pi \geq 1.1$ on the inflation-response grid and $\gamma_b \geq 0.04$ on the fiscal-feedback grid. Lower ϕ_π produces indeterminacy, while lower γ_b produces no stable equilibrium.

³¹The determinacy checks use one-at-a-time grids at $n = 0.005$: $\phi_\pi = 0 : 0.1 : 2.5$, $\gamma_b = 0 : 0.01 : 0.20$, and steady-state debt from 0 to 1 in steps of 0.05. These are tested grid ranges, not exact analytical thresholds.

- **Simple PM/AF:** the model is determinate for $0 \leq \phi_\pi \leq 1.0$ on the inflation-response grid and for $\gamma_b \leq 0.03$ on the fiscal-feedback grid. Raising ϕ_π above one produces no stable equilibrium, while stronger fiscal feedback produces indeterminacy.

Positive steady-state debt between 0.05 and 1.0 is determinate in both regimes on the debt grid.

Transfer multipliers (no parallel rate). At the baseline policy coefficients, changing fiscal/monetary regimes has little effect on the aggregate multiplier, and almost no effect on the local multiplier. As shown in Appendix Table D1, switching from simple AM/PF to simple PM/AF raises the aggregate multiplier from 0.661 to 0.691 when $n = 0.005$, and from 0.604 to 0.626 when $n = 0.15$.³²

Appendix D.1.3. Parallel exchange rate

With $\rho_{eo} = 0.95$, looping over the same policy variables gives the following determinacy regions:

- **Simple AM/PF:** the model is determinate for $\phi_\pi \geq 1.0$ on the inflation-response grid and $\gamma_b \geq 0.04$ on the fiscal-feedback grid. $0 \leq \phi_\pi \leq 0.5$ produces indeterminacy, while $0.6 \leq \phi_\pi \leq 0.9$ and lower γ_b produce no stable equilibrium.
- **Simple PM/AF:** the model is determinate for $0 \leq \phi_\pi \leq 0.5$ on the inflation-response grid and for $\gamma_b \leq 0.03$ on the fiscal-feedback grid. Higher ϕ_π produces no stable equilibrium, while stronger fiscal feedback produces indeterminacy.

Positive steady-state debt between 0.05 and 1.0 is determinate in both regimes on the debt grid.

Transfer multipliers (with parallel rate). At the baseline policy coefficients, switching from simple AM/PF to simple PM/AF lowers the aggregate multiplier from 0.934 to 0.710 when $n = 0.005$, and from 0.885 to 0.647 when $n = 0.15$. However, this -0.22 change is only relative to a simple AM/PF Taylor rule; if instead we compare to the baseline AM/PF smoothed Taylor rule in the main text, the change is only -0.01, suggesting that it is not the AM/PF to PM/AF switch that is important, but rather the coefficients in the AM/PF Taylor rule, as discussed below. At $n = 0.005$, the local multiplier is 1.08 (as in the main text) in all three monetary-fiscal regimes.³³

³²Conditional on a successful solution, the aggregate multiplier is constant over different fiscal-feedback values under simple AM/PF and over the different levels of steady state debt in both regimes. It ranges from 0.661 to 0.697 over the successful simple AM/PF inflation-response grid, and from 0.691 to 0.704 over the successful simple PM/AF fiscal-feedback grid.

³³Conditional on a successful solution, the aggregate multiplier is constant over different fiscal feedback values under simple AM/PF and over the positive-debt grid in both regimes. It ranges from 0.734 to 1.383 over the successful simple AM/PF inflation-response grid, and from 0.710 to 0.716 over the successful simple PM/AF fiscal-feedback grid.

Table D1: Transfer multipliers in a model with fiscal dominance

Policy regime	n	Local		Aggregate	
		No parallel	Parallel	No parallel	Parallel
AM/PF, smoothed Taylor rule	0.005	1.08	1.08	0.63	0.72
AM/PF, simple Taylor rule	0.005	1.08	1.08	0.66	0.93
PM/AF, simple Taylor rule	0.005	1.08	1.08	0.69	0.71
AM/PF, smoothed Taylor rule	0.150	0.99	1.00	0.58	0.67
AM/PF, simple Taylor rule	0.150	0.99	1.04	0.60	0.89
PM/AF, simple Taylor rule	0.150	1.00	1.00	0.63	0.65

Notes: Multipliers measure output per unit of net transfer received by households, as in the Default Definition from main text Table 2. The $n = 0.15$ rows retain the baseline hand-to-mouth shares $\omega = 0.95$ and $\omega^* = 0.63$ to isolate the impact of fiscal dominance, and so are not directly comparable to the scale-up results in Table 2, which adjust these shares with program size.

Discussion. The most notable change in aggregate multipliers in Appendix Table D1 is not across monetary-fiscal regimes, but *within* the AM/PF parallel regime as the short-run monetary policy response to inflation changes. Specifically, the aggregate multiplier with $n = 0.005$ rises from 0.72 to 0.93 moving from a smoothed Taylor rule to a simple Taylor rule within the AM/PF parallel regime. Even though ϕ_π is the same in both cases, the smoothed Taylor rule mutes the short-run interest rate response to inflation.³⁴ This change also raises the aggregate multiplier in the no-parallel case, but by only 0.03.

A larger short-run Taylor rule inflation coefficient raises the aggregate multiplier because the GiveDirectly transfer reduces aggregate inflation. A stronger response to this fall in inflation produces a larger interest-rate cut, supporting household spending. Although the transfer generates a small increase in treatment-region inflation (as in Figure 2), with restricted capital mobility the exchange rate appreciation is large enough that the fall in import prices dominates at the national level. The fall in aggregate inflation is larger for the parallel-rate regime, which then makes the aggregate multiplier in that regime more sensitive to changes in the Taylor-rule inflation coefficient.³⁵

Appendix D.2. Imported intermediate inputs.

Since a large fraction of Malawi’s imports consists of intermediate inputs used in production, such as fuel and fertilizers, we extend the model to include imported intermediates in the production

³⁴The comparison also removes the output response, setting $\phi_Y = 0$; separate simulations show that smoothing accounts for most of this difference.

³⁵For example, at $n = 0.005$, raising ϕ_π from 1.5 to 3 increases the aggregate multiplier from 0.934 to 1.575 with the parallel rate regime, compared with 0.661 to 0.731 without it (not reported in the table and other coefficients unchanged).

functions of both the tradable and non-tradable sectors. More specifically, the production function for tradable goods is

$$Y_t^T(i) = [A_t^T L_t^T(i)^{\alpha_L}]^{1-\alpha_M^T} M_t^T(i)^{\alpha_M^T}, \quad (\text{D.4})$$

where $M_t^T(i)$ denotes the imported intermediate input used by firm i in the tradable sector, and α_M^T determines the importance of imported intermediates in production. The production function for non-tradable goods is analogous, with imported input $M_t^S(i)$ and share parameter α_M^S . We assume that the steady-state imported-intermediate share of gross output is the same across sectors.³⁶

To isolate the role of imported intermediate inputs, we conduct this exercise under the single flexible exchange-rate regime.³⁷ We vary α_M^T and α_M^S while reallocating imports from consumption to intermediate inputs to maintain the same steady-state ratio of total imports to value added.

Under our calibration, we find that both local and aggregate value-added multipliers decline as the share of imported intermediate inputs increases. Reallocating imports from consumption to intermediate inputs generates competing effects. Reducing consumption imports increases demand for domestically produced goods and tends to raise gross output.³⁸ At the same time, greater reliance on imported intermediate inputs means that a larger share of gross output reflects these imported inputs rather than domestic value added. In our quantitative exercise, the latter effect dominates, resulting in lower local and aggregate value-added multipliers.

Appendix D.3. Dynamics and Cumulative Multipliers.

In this section, we examine the dynamics of the multipliers at longer horizons. Figure B9 plots the dynamic response of the local, spillover, and aggregate GDP multipliers (rows) to the same one-time cash transfer studied in Section 7, under each of the three macro regimes (columns). Within each panel, the dotted line is the per-period impulse response of GDP, scaled to be a dollar-for-dollar multiplier. The solid line is the cumulative multiplier, the sum of per-period responses through year t .³⁹

³⁶We define value added as gross output net of imported intermediate inputs, with both measured at steady-state prices. We assume that the price of imported intermediate goods is the same as the price of imported tradable goods.

³⁷The model with sufficiently large imported-input shares does not satisfy the conditions for a unique equilibrium under the benchmark highly persistent official exchange-rate rule. We therefore conduct this appendix exercise under the single flexible exchange-rate regime.

³⁸Reducing imports of tradable consumption goods requires greater domestic production of tradable goods, increasing the relative size of the tradable sector. Because the non-tradable sector accounts for a larger share of the transfer-induced output response, this compositional change also affects the multipliers.

³⁹Because the transfer is one-off in the first year, the sum of GDP impacts through year t equals the cumulative multiplier.

The top row of Figure B9 shows little dynamics: cumulative local multipliers do not depend on the horizon. Across all three regimes, treated-region GDP rises by about MWK 1.08 in the year of disbursement and returns to baseline the following year, so the cumulative local multiplier is equal to the impact multiplier.

For spillover multipliers (middle row) and aggregate multipliers (bottom row), the dynamics are more important. Although unrestricted capital mobility leads to a *large and positive* spillover multiplier on impact, the effect on GDP of the control region turns negative in later years. Under restricted capital mobility, spillovers are negative on impact and remain negative at longer horizons. Hence in all three cases, spillover cumulative multipliers fall over time.

The exchange rate regime is an important determinant of the speed of adjustment. With a flexible exchange rate, adjustment is fast and so the impact on GDP in the control region becomes smaller over time and is close to zero by year 5. In contrast, with a fixed exchange rate, the effect on control-region GDP remains substantially negative even at year five.

At moderate horizons, the aggregate cumulative multipliers are much smaller than at impact, and the unrestricted capital mobility with flexible exchange rate regime now produces the largest value. By year 5, the unrestricted capital mobility with flexible exchange rate regime's cumulative aggregate multiplier is 0.53, above the unrestricted capital mobility with fixed exchange rate regime's multiplier of 0.26, both well below the impact-year multipliers of 1.56 and 2.03, respectively. The restricted capital mobility regime has the lowest cumulative aggregate multiplier at the 5-year horizon (0.15). The intuition for the flipped ranking is that, although a fixed exchange rate produces large multipliers in the short term, it spreads the adjustment over a longer period.

Appendix D.4. Price Indexation

In this section, we investigate robustness to the type of price indexation (or lack thereof). In the baseline calibration, we set ω_{bl} to be 80% Gali-Gertler rule-of-thumb indexers, who index to national population-weighted sectoral inflation.⁴⁰ We consider two other alternatives. The first alternative has firms index to their own region's past sectoral inflation. The second alternative is the standard Calvo pricing without backward indexation, where 62% of firms are not able to adjust prices each year, but there are no rule-of-thumb indexers.⁴¹

⁴⁰This assumption is based on the empirical observation that in high-inflation countries, many firms index to the national CPI, which is more observable than alternative price indices.

⁴¹62% is set to approximately match the size of the first year multipliers.

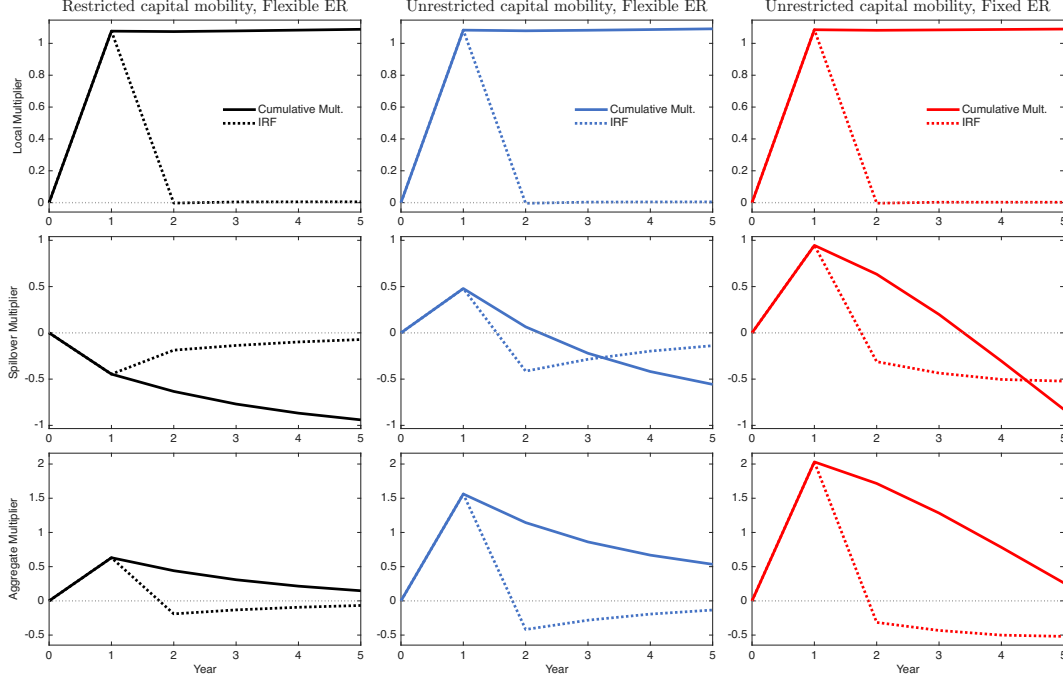


Figure B9: Per-period IRFs and cumulative multipliers by policy regime

Notes: The figure shows the dynamic response of Local, Spillover, and Aggregate GDP multipliers (rows) to a one-time GiveDirectly cash transfer to the treated region, under three policy regimes (columns): restricted capital mobility with flexible exchange rate (black), unrestricted capital mobility with flexible exchange rate (blue), and unrestricted capital mobility with fixed exchange rate (red). Within each panel, the solid line is the cumulative multiplier and the dotted line is the per-period impulse response of GDP (scaled per dollar of transfers). Multipliers are defined as in Section 7. Time is annual, with $t = 0$ denoting the pre-shock steady state.

Table D2: Multipliers under alternative indexation assumptions

Scenario	Type	A. Impact Multiplier (First Year)			B. Five-Year Cumulative Multipliers		
		Default (National)	Local Indexation	None (Calvo)	Default (National)	Local Indexation	None (Calvo)
Restricted capital mobility, Parallel exchange rate	Local	1.08	1.08	1.08	1.09	0.05	0.89
	Spillover	-0.35	-0.34	-0.35	-1.27	-0.28	-0.89
	Aggregate	0.72	0.74	0.73	-0.18	-0.23	0.00
Restricted capital mobility, Flexible exchange rate	Local	1.08	1.08	1.08	1.09	0.05	0.89
	Spillover	-0.45	-0.43	-0.49	-0.94	0.04	-0.65
	Aggregate	0.63	0.64	0.59	0.15	0.09	0.24
Unrestricted capital mobility, Flexible exchange rate	Local	1.08	1.08	1.09	1.09	0.06	0.90
	Spillover	0.48	0.49	0.38	-0.56	0.45	-0.16
	Aggregate	1.56	1.57	1.47	0.53	0.51	0.73
Unrestricted capital mobility, Fixed exchange rate	Local	1.09	1.08	1.09	1.09	0.05	0.90
	Spillover	0.95	0.95	0.96	-0.83	0.17	0.86
	Aggregate	2.03	2.03	2.05	0.26	0.22	1.76

Appendix Table D2 shows that on-impact local, spillover, and aggregate multipliers are almost completely unaffected by the type of indexation, or whether prices are sticky in a conventional sense (Panel A). However, the 5-year cumulative multiplier can sometimes differ.

Moving from national to local indexation generally results in almost identical 5-year aggregate

cumulative multipliers, though with different drivers. For example, in both indexation regimes the largest multiplier continues to be in the unrestricted capital mobility with flexible exchange rate case (0.51), with the unrestricted capital mobility with fixed exchange rate case second (0.22) and the restricted capital mobility cases with and without parallel exchange rate have smallest 5-year cumulative multipliers (-0.23 and 0.09 , respectively). However, the dynamics of how the aggregate multiplier is generated is quite different. Specifically, instead of a falling spillover cumulative multiplier (as in [Appendix D.3](#)), it is the local cumulative multiplier that falls. The reason is that price indexation distorts future relative prices. In the baseline, future relative prices in the home region are less distorted, because national prices move less than local prices in the first year. However control-region prices are relatively more distorted, because the control region inherits some of the inflation from the transfer in the home region. This means that in the baseline, control region prices are too high for the level of demand, resulting in a negative GDP impact. With local indexation, it is the opposite—local prices continue to rise in the home region, depressing future output, whereas they are closer to steady state in the control region. That is, the local and spillover changes are equal but opposite ($\Delta \text{Local} \approx -\Delta \text{Spillover}$ in every regime), because indexation shifts where the price distortion ends up (home vs control region) without affecting the aggregate response.

If we assume standard Calvo pricing without indexation, most multipliers are similar to the baseline, with the exception of much larger aggregate and spillover cumulative multipliers in the fixed exchange rate regime. Specifically, cumulative local multipliers without indexation after 5 years are fairly similar to the baseline at around 0.89 , close to 1.09 in the baseline. Five-year cumulative spillover and aggregate multipliers are modestly higher than the baseline for restricted capital mobility and unrestricted capital mobility with flexible exchange rate cases. However, with a fixed exchange rate and unrestricted capital mobility regime, the five-year aggregate cumulative multiplier is 1.76 , which is much larger than the 0.26 in the baseline. The reason is not that the control-region price level is much higher with national indexation, though this is also true. Rather, the larger price distortions matter more for the output response under the fixed exchange rate regime than under the flexible exchange rate regime.

In sum, while the impact multipliers are always robust, the size and ranking of the medium-run cumulative multipliers can depend on the model specifications. Compared with the baseline, local cumulative multipliers are lower with local indexation, and spillover multipliers are higher, while aggregate multipliers are unchanged.