The sources of factor immobility among self-employed workers

Romaine Loubes*

Abstract

Most of our understanding of trade shocks and labor markets pertains to salaried workers. It is unclear whether trade shocks similarly displace self-employed workers who have control over much more margins, including job exit. Still, this question is crucial for low-income countries, where self-employment is the most prevalent status. To address this gap, I examine an exogenous import tariff shock that affected an entirely self-employed sector, used clothing retail, in Rwanda, using censuses of formal and informal establishments and household data on business owners' firms, other jobs, and spouses. When self-employed workers' firms are exposed to the shock, they experience sizable productivity decreases. Unlike previous works on wage earners, however, they do not close or reduce their working hours. To explain this immobility, I develop a time allocation framework that ties outside employment quality to elasticity to productivity shocks. The prediction holds when comparing men to women, and men living in high-opportunity areas to others. The model further predicts that relatives' outside options matter for entrepreneurs' reallocation strategies. A spouse with more job opportunities can smooth consumption while the affected business owner looks for another job, while a spouse with fewer outside options is more available to contribute unpaid labor to the family firm, increasing observed firm productivity. I integrate these two spousal-delivered insurance strategies into the model and disentangle them using comprehensive data on each spouse's hours and status within the firm. I use detailed data on spousal status and outside options to disentangle the two spousal insurance channels, and results suggest that the latter dominates: spouses with greater availability increase their supply of domestic labor, and their partners experience smaller productivity reductions. These findings highlight the role of outside options, both for the self-employed worker and their networks, with sizable implications for gender inequality in shock resilience and policy incidence in countries with high self-employment rates.

JEL: F13, F16, J22, J46, J62, O12

Keywords: Self-employment, Trade policy, Labor market power, Labor supply, Occupational mobility

*Paris School of Economics. Email: romaine.loubes@psemail.eu. I am very grateful to David Margolis and Ariell Reshef for their continuous support and feedback. I thank David Autor, Oriana Bandiera, Vittorio Bassi, Lauren Bergquist, Thomas Bézy, Thomas Breda, David Card, Anne-Célia Disdier, Matthias Doepke, Benjamin Faber, Supreet Kaur, Patrick Kline, Brian Kovak, Sylvie Lambert, Rocco Macchiavello, David McKenzie, Monica Morlacco, Edward Miguel, Mathilde Muñoz, Emily Nix, Gianluca Orefice, Mathieu Parenti, Thomas Piketty, Imran Rasul, Yona Rubinstein, Sandra Poncet, Thiago Scarelli, Elena Stancanelli, Akiko Suwa-Eisenmann, Gabriel Ulyssea, Pierre-Louis Vézina, Oliver Vanden-Eynde, Liam Wren-Lewis, as well as seminar participants at PSE, Paris 1 Panthéon Sorbonne, UC Berkeley, the CSAE 2024 and 2025, Paris Dauphine, ENS Lyon, Harvard, LSE, Torino-CCA, the Sciences Po 2023 CEPR Symposium, the LSE 2024 CEPR Symposium, CITP, SOLE, EUDN PhD Workshop, EAYE, Queen Mary PhD Workshop, JMA 2024, HEC PhD Workshop, UCL PhD workshop, and ICDE for their important comments. I thank the National Institute of Statistics Rwanda for granting me access to licensed datasets and helping me understand them. This research has benefited from funding and insights from IGC Rwanda.

Sub-Saharan Africa is the region with the lowest share of salaried workers: 24.5% in 2019 (ILOSTAT). While trade policy is a strategic pillar of regional development, as shown by the African Continental Free Trade Area discussions, research on trade and labor markets has primarily focused on salaried workers' outcomes and little is known about the way that trade impacts the majority of workers, who are self-employed. This paper investigates the following questions: How do the self-employed adjust to trade shocks in low-income countries? In particular, what self-employment-specific mechanisms change policy impact in markets where self-employment is prevalent?

Trade adjustment is increasingly relevant in a world where protectionist policies are on the rise. In 2016, the East African Community (EAC) announced the implementation of prohibitive import tariffs on used clothing, a North-South trade that represents a sizable share of urban households' clothing consumption (around 75% for Tanzania (Foundation, 2017)). Facing threats of exclusion from the African Growth Opportunity Act, a free trade agreement with the United States, all EAC countries except abandoned the plan. Rwanda increased its tariffs tenfold in June 2016, leading to the apparel sector's exclusion from AGOA in 2018. The measure aimed to recapture domestic demand and develop the apparel industry. Its most immediate effect, however, was a dramatic decrease in used clothing imports and a price increase for local wholesalers and retailers - a workforce comprised almost entirely of self-employed workers[1].

Sub-Saharan Africa is the only region where self-employment did not decrease alongside with the decline in agriculture (Bandiera et al., 2022b), despite sizable trade and industrial policies[2]. However, research on how trade and industrial policies impact non-farm self-employed labor markets has been scant. This research gap is all the more important as one cannot deduce potential policy impact from the results of research conducted on salaried labor markets, because self-employed workers make choices along more dimensions. Self-employment grants workers total decision-making power over job exit, and hours input, while even in informal wage work, some downward wage rigidity remains (Kaur, 2019). Faced with similar hourly earnings, informal wage workers may be laid off, while self-employed workers may choose to maintain or even increase their hours if they lack alternative employment options. Self-employed workers can also integrate their relatives' labor into their firm to mitigate shocks (Beegle et al., 2006; Dumas, 2020), providing them with additional adaptation strategies. Comapred to wage work, self-employment offers two types of insurance against shocks: it prevents workers from being laid off or underemployed compared to consumption preferences, and allows them to incorporate their relatives' labor into the firm. Understanding who relies on these insurances and which workers can use family labor and implement these insurance strategies is crucial to understanding differential - and notably gendered - aspects of trade shocks. This knowledge is essential for evaluating how trade and industrial policy can spur transitions to wage employment.

To address the knowledge gap on policy incidence in self-employed markets, I use a novel setting in which Rwanda's trade policy occasioned a dramatic increase in the price of the sole inputs for a non-farm, predom-

[1] 89% both pre-and post-shock (IHLCS)

[2] See Fernandes et al. (2019) for an analysis of the lack of long-term effects of duty-free export agreements in Africa and Bandiera et al. (2022a) for analyses of training, labor demand, and matching in SSA, that note a hard-to move low equilibrium with few wage jobs and many unproductive small firms.

inantly self-employed sector: used clothing retail. The setting adds to our understanding of trade shochs on the retail sector and in Sub-Saharan Africa, where evidence has been scarce due to data unavailability (McCaig and McMillan, 2020), and through a protectionist shock. However, as Rwanda's import tariffs made second-hand clothing more expensive without its domestic sector taking over, their effects were likened to an increase in the competitiveness of foreign new clothing. Therefore, results will be put in perspective with the literature on trade-induced increases in foreign competition.

My data allows me to exploit this setting, drop unrealistic assumptions, and dig deeper into workers' adaptation strategies. Importantly, I use licensed establishment censuses for both formal and informal plants. In contrast to works using formal-only panels (Dix-Carneiro and Kovak (2017, 2019), although informality is explored as an adjustment margin at the regional level), I do not have to assume that informal workers and establishments follow trajectories similar to formal ones. This assumption is also dropped in McCaig and Pavcnik (2018) or Dix-Carneiro et al. (2024), but such data has lacked thus far in Sub-Saharan Africa. Fine-grain licensed survey data enables me to quantify workers' outcomes at the ISIC-3 digit level for each job throughout the year. Quantifying reallocation at a lower scale than the individual level matters, because a sizeable share of the Rwandan workforce - about 28% in 2016[3] and 36% of the self-employed - holds several jobs at once. By discarding the assumption that time allocation across jobs does not change because of trade shocks, I can reveal novel patterns of job substitution within the week. Finally, the data provides comprehensive information on the role of each household member at the firm and at home, whether paid or unpaid, in contrast to datasets describing only the best-paid job of the week. Such information is seldom available alongside the time use variables the dataset provides. Using this setting and data allows me to identify a new coping mechanism and demonstrate the porosity between market and domestic labor in this context.

My empirical strategy combines pre-shock spatial exposure to used clothing trade with individual variation in having a job (job-level outcomes) or having had a job (individual-level) in self-employed retail before the shock, into a triple difference approach. I develop a framework to understand the results, and in line with its predictions, I study two dimensions of factor immobility - own outside options, which influences elasticity to a shock, and relatives' outside options, which can mitigate the impact of the shock itself - along three broad sets of outcomes: exposure, adaptation, and resilience to policy-induced productivity reductions.

The findings on self-employed workers' exposure, adaptation, and resilience to the input tariff shock contrast with evidence of trade-driven displacement in other contexts (Dix-Carneiro and Kovak, 2017, 2019, 2023; Ponczek and Ulyssea, 2021; Erten and Keskin, 2021; McCaig and Pavcnik, 2018; Bas and Bombarda, 2023). Despite a) 10% slower hourly earnings growth for retailers in affected areas compared to those in non-affected areas- an effect driven by turnover falling more than non-labor expenses, and that could be as high as 80% when considering that only 1/8 of self-employed retailers sell used clothing - affected retailers b) do not leave their jobs, become unemployed, migrate, or even reduce their working hours at the affected job in response to the shock. As a result workers c) show limited resilience to the shock, and the retail income premium grows 6% slower in exposed areas up to 18 months after the shock, despite changes in hours allocated to other jobs. These results suggest that coping mechanisms specific to self-employed workers can

[3] Source: Integrated Household Living Conditions Survey 2016

change the impact of policy: self-employed workers suffer a cost shock that translates into a large hourly production shock, do not get displaced like salaried workers could, and adapt outside the boundaries of their affected job.

I develop a framework to explain these surprising results. Workers may remain in declining jobs when they lack outside employment options, especially in contexts with no unemployment benefits, where self-employment serves as insurance against unemployment or underemployment. Additionally, workers may be less likely to leave if they can implement strategies to mitigate the effect of the cost shocks on their firm's productivity. For instance, productivity-enhancing domestic work, such as ironing clothing, might improve perceived product quality and mitigate productivity impacts without being counted as work at the firm. The extent to which self-employed workers benefit from this insurance depends on the availability of other household members to perform this domestic work.

First, I show that a lack of outside options exacerbates factor immobility among the self-employed, consistent with the framework. By isolating two population categories with lower access to good jobs - women and workers in low-opportunity areas - I find i) negative own hourly earnings labor supply elasticity. Despite being the most exposed, women and workers in low-opportunity areas increase working hours in response to productivity decrease at the affected firm. This is related to women taking up fewer additional jobs, consistent with lower labor market access than men.

Second, I extend the framework to include and separate several roles a spouse can play. Using comprehensive data on the organization of production at the firm and at home, I can distinguish between the income-preserving effect of having a spouse for earnings diversification and domestic work, the additional effect of having a spouse work at the firm, and the productivity-enhancing role of spousal domestic labor for firms. I assume that spouses who do not earn personal income from productive work are more available to supply the latter. By comparing married businessmen who work alone at the firm, those who work with their paid spouse, and those whose unpaid spouse works at the firm, I find that A) married men are the only group protected from the cost shock's effect on their hourly earnings B) married men are much less likely to work alone at the firm than married women retailers, and that when they work with their spouse, they only pay them in 75% of cases, compared to 95% for women. C) Non-participating wives and unpaid participating wives increase their domestic work in response to their husbands' firm shock, while this is not the case for husbands working with paid wives. The results suggest that the firm productivity insurance role of available spouse's domestic work dominates compared to other roles of spousal work, such as unpaid productive work, though these coefficients are less precisely estimated.

These results indicate that two dimensions of workers' employment alternatives, their own and the ones of their relatives, are exacerbated in the context of self-employment and response to trade shocks. As such, lessons from trade shocks in other contexts might not translate automatically to self-employment-intensive low-opportunity settings, as workers in these settings have unique mitigation strategies and incentives that discourage them from seeking alternative employment.

This paper contributes to several strands of the literature. First, it adds to the body of work on the effects of trade policy on local labor markets in developing countries, with a particular focus on the informal

sector. Studies on increased competition due to trade liberalization, such as those in Brazil, (Dix-Carneiro and Kovak, 2017, 2019; Ponczek and Ulyssea, 2021)have shown that workers initially employed in the tradable sector are often displaced to unemployment and then to lower-paid, frequently informal, jobs. Works have related informality to trade in two ways: by examining how trade affects informality rates, for example, through expanded export markets for formal firms (McCaig and Pavcnik, 2018), better access to inputs (Bas and Bombarda, 2023), or import competition (Wang et al., 2021). The second approaches explore how the presence of informality alters the effects of the trade itself (Dix-Carneiro et al., 2021), as "The effects of trade policy on labor market outcomes depend on relevant labor market frictions within a country" (Goldberg and Pavcnik, 2016). Informality can act as an "unemployment buffer" (Ponczek and Ulyssea, 2021), muting unemployment responses to shocks. This paper extends these approaches by demonstrating that self-employment is conceptually distinct from wage informality and merits separate investigation. These findings are novel partly due to data constraints that have led existing literature to focus on Latin America (Dix-Carneiro and Kovak, 2023) or Southeast Asia [4]. My setting, framework and results also differ from the closely related focus of McCaig and Pavcnik (2018), which examines family firms' shock adaptation dynamics in Vietnam. The authors model for sectors in which both formal and informal firms operate, which is not the case for the particular case I study. As a result, my predicts different response from those of a Melitz-type model. I also further their exploration of family firms by digging deeper into the interlinks between spouses' occupations by accessing data on each spouse's status within the firm.

I make a second contribution to the literature concerned with factor immobility as a response to trade shocks. Reallocation following a shock is imperfect: exposed regions and individuals face earnings decreases and do not respond automatically through migration or sectoral reallocation (Topalova, 2010), leading to widening gaps between exposed and non-exposed regions over time (Dix-Carneiro and Kovak, 2019). Most empirical studies find that the most immobile segments of the population;those with the fewest resources (Topalova, 2010), older workers from less internationally integrated regions (McCaig and Pavcnik, 2018), women (Mansour et al., 2022; Roche Rodriguez et al., 2023) or less skilled workers (Bas and Bombarda, 2023; Keller and Utar, 2023; Kelishomi and Nisticò, 2023), are the most vulnerable ones. This phenomenon is formalized in Adão (2016), where different population categories have different comparative advantage schedules, influencing their resilience. Some works have linked turnover and development, finding higher turnover rates in developing countries (Donovan et al., 2023) and exploring the benefits of these transitions for workers climbing the job ladder (McCaig and Pavcnik, 2021; McKenzie and Paffhausen, 2019). I add value to this literature by using an exogenous shock and demonstrating that the most marginal workers - those who live in low-opportunity areas, especially women - have a lower hours elasticity to productivity decreases. I further this literature by showing that, beyond worker with limited outside options, workers married to spouses with limited outside options - in that they are not part of the wage-earning labor market - also remain longer at their declining firms. This is because they can leverage their spouse's unpaid domestic and productive work in response to productivity decreases at their firm.

Third, this works adds value to the literature on frictions in developing labor markets and how workers

[4] as noted for sub-Saharan Africa in McCaig and McMillan (2020) in their study of Botswana, with their work and Erten et al. (2019) important exceptions

cope with shocks despite frictions. Deviations for perfect labor market functioning (Kaur, 2019; Amodio et al., 2022; Sharma, 2023; Breza et al., 2021; Hardy and Kagy, 2020) create involuntary unemployment, survival self-employment (Lewis et al., 1954; Gindling et al., 2016; Bandiera et al., 2022a; Breza et al., 2021; Amodio et al., 2022; Scarelli and Margolis, 2021), and greater rigidity in wages and labor supply (Sharma, 2023; Hardy and Kagy, 2020; Caldwell and Oehlsen, 2022). To negotiate these environments and resist shocks, workers apply various coping mechanisms, which depend on their margins of adaptation. This is the same for self-employed workers, whose firms tend to be more "survivalist", lacking growth prospects and-facing credit constraints (Grimm et al., 2012), especially in labor markets with segmentation for women's firms (Bandiera et al., 2022b; Hardy and Kagy, 2020). Existing research on coping strategies in developing countries has primarily focused on farm households, including children's labor (Beegle et al., 2006; Dumas, 2020), non-farm business creation (Adhvaryu et al., 2021), and norms and opportunities specific to women's labor participation (Jayachandran, 2021) for income smoothing through spousal labor (Erten and Keskin, 2021; Zhang, 2014). This paper corroborates the finding that women's firms tend to be survivalist and that, because of these different constraints and opportunities, gender-neutral policies have a gendered effect, (Erten and Keskin, 2021; Sanin, 2021). Additionally, I identify a new coping mechanism for urban non-farm households facing permanent productivity shocks: the use of productivity-enhancing spousal labor from unpaid non-farm collaborators as insurance against productivity shocks. This novel mechanism sheds new light on findings that women's firms are always less productive than men's (Hardy and Kagy, 2020), as undocumented productivity-enhancing domestic work could explain part of this gap.

Finally, this paper adds to the literature on spousal insurance. Having a spouse reduces wage variability (Zhang, 2014; Blundell et al., 2016). and can act as a substitute to disability insurance (Autor et al., 2019), survivors' pension (Persson, 2020), or unemployment insurance (Cullen and Gruber, 2000). Spousal insurance becomes even more desirable when work becomes more unstable (Clark et al., 2023). Evidence from developing countries also supports the protective role of spouses against shocks, often through the added worker effect (Erten and Keskin, 2021). Additionally, spouses' domestic labor—the production of domestic goods in collective household models—and the potential for specialization in domestic work within marriage allow couples to benefit from economies of scale and achieve higher total income levels. This is particularly relevant for jobs with increasing marginal returns or when childcare demands arise. This paper extends the spousal insurance literature by identifying a new role for domestic and productive work in the context of family firms: protecting firm productivity in the face of shocks through productivity-enhancing domestic work. This effect is measured in a market featuring rich heterogeneity in household and business structures, but the prevalence of family firms makes the insights applicable to many contexts.

The paper proceeds as follows: section 1 covers the context, section 2 describes the data used and section 3 the empirical stragtegy. Section 4 presents the main results on the global population. section 5 develops a framework to explain the results and derives predictions on shock responses depending on outside options that are tested in section 6. Section 7 extends the framework to a household level problem, makes predictions with respect to spousal availability, tests them and addresses concurrent hypotheses. Section 8 concludes.

1 Rwanda's 2016 tariff increase on used clothing imports

The used clothing sector in the trade landscape: share of domestic demand and imports

Used clothing is a significant and expanding trade that primarily flows from rich countries to poorer ones, particularly in Sub-Saharan Africa. In 2020, 4 out of the 5 top importers of used clothes were Sub-Saharan African countries, each importing over 100 million dollars of these goods annually (Cobbing et al., 2022). Used clothes, known as $caguwa$ in Kinyarwanda[5], have been criticized by governments for hindering the development of the local textile and garment sectors. Frazer (2008) Attributes up to 40% of the decrease in the apparel sector's share of manufacturing and of jobs across many African countries to this trade. Cultural concerns have also been raised, with citizens and governments arguing that these imports are displacing traditional clothing and contributing to environmental issues, as a significant portion of imported used clothing ends up in landfills (Cobbing et al., 2022). Rwanda's intent to ban *caguwa* imports was announced in 2016, as part of an East Africa Community[6] common project to raise tariffs on second-hand clothing imports (Wolff, 2021). However, faced with the threat of exclusion from the Africa Growth and Opportunity Act (AGOA) [7], all EAC countries except Rwanda abandoned the project. Rwanda implemented the he tariff increase in 2016, raising duties from $0.5 to $5 per kilogram on used shoes and $2.5 per kilogram on used clothing (*RWANDA VISION 2020*, 2000). Rwanda was suspended from AGOA in 2018. In the meantime, there was no sizeable substitution of domestic production to these imports, as shown by the decision not to implement further tariff hikes beyond 2.50 USD /kg as initially planned[8].

The measure was implemented 6 months from the initial EAC-wide proposal and proved effective in reducing imports of second-hand clothing. Figure 1 illustrates the trends in new and used clothing import volumes in Rwanda and the ratio of clothing prices to the general consumer price index for both urban and rural areas. After 2016, the volume of used clothing imports into Rwanda consistently decreased, aligning with the increased per-kilogram tariff. As a result of the measure, the years-long decreasing trend of clothing prices relative to other goods' prices was halted (Figure 1). This effect was more immediate in urban areas than in rural areas, likely due to faster depletion of stocks in urban centers or slower supply chains in rural regions. The tariff had a notable impact on country-level metrics such as imports and prices, suggesting that the effects were significant enough to trigger individual adaptation responses.

The Used Clothing Sector: Employment, Supply Chain and Working Conditions

Used clothing is a significant employer in the urban areas of many African countries. The industry creates as much as 121,000 jobs in Kenya (Wolff, 2021). Pre-shock Census data from Rwanda indicates that clothing retail, which includes $caguwa$ retail, constitutes up to 1/8 of the retail sector in the most exposed districts (EC 2014). While the used clothing supply chain has not been quantitatively studied, qualitative accounts of used clothing trade in neighboring countries (Brooks and Simons, 2012; Brooks, 2012; Mesa, 2021) or of the $caguwa$ import tariff (Behuria, 2019) describe a structure consisting of a few wholesalers who import bales of

[5] the official language of Rwanda

[6] Customs Union comprising Kenya, Rwanda, Uganda, Burundi, Tanzania. The DRC and South Sudan joined after 2016

[7] a program which allows selected African countries to export certain goods to the US duty-free

[8] Strategy For The Transformation Of Textile, Apparel And Leather Sectors in Rwanda, MINICOM 2022

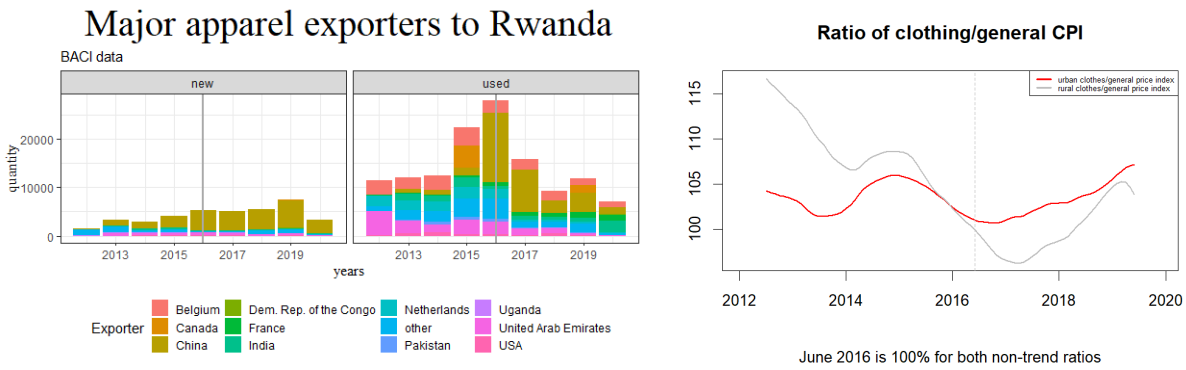

Figure 1: Clothing import quantities (left) and consumer prices

clothing and resell them to numerous retailers. This supply chain has unique characteristics that differentiate it from new clothing retail. first, although the bales can sorted and classified by categories, the specific pieces of clothing cannot be observed before purchase, and this adds uncertainty to the retailers' livelihoods - especially when bales are not adapted to local meteorological conditions or tastes (Cobbing et al., 2022). The structure of the supply chain, with plane- or truck-dependent international arrivals at wholesalers' precincts, means that supply is fragmented, and studies in the DRC (Mesa, 2021) note that retailers face difficulties restocking once their bales are sold. Finally, most *caguwa* retailers work on temporary premises and have limited power to build inventory. For instance, when Kenya installed a temporary COVID-19-related ban on used clothing, retailers reported having only about a month's worth of inventory, aligning with the rapid rise in the Consumer Price Index (CPI) observed in Rwanda.

Table 1 presents summary statistics comparing *caguwa* firms to other retail firms and the broader firm environment.[9]. *Caguwa* firms are more likely to be women-owned, very small, and operating on temporary premises. This can intensify the fragmented nature of the used clothing supply chain and aligns with the fact that, before the shock, independent retailers were working more jobs per week and working fewer hours than other workers despite higher hourly wages at that occupation (IHLCS, 2013).

2 Data

My empirical strategy combines geographical variation in ex-ante exposure to the *caguwa* trade with individual-level variation in ex-ante self-employed retail work. First, I describe the Establishment and Population Censuses, used to construct the spatial exposure index. Then, I describe the household survey data from which I get individual-level variation and outcomes.

Spatial index of *caguwa* intensity: Establishment Censuses, 2012 Housing and Population Census The Establishment Census is a census of the universe of formal and informal establishments conducted every

[9]The data is derived from the private 2017 version of the Census, for which I observed the name of the firm. *caguwa* firms designates firms with *caguwa* in their name or enumerator-written description, a lower bound for the actual number of *caguwa* firms. Note that similar statistics from pre-shock data could not be provided.

	Caguwa Retail	outside Caguwa	Other
Operating in market	0.81	0.18	0.05
	(0.39)	(0.39)	(0.23)
Woman manager	0.50	0.38	0.27
	(0.50)	(0.49)	(0.45)
Firm age	3.12	2.40	4.55
	(4.29)	(3.87)	(10.74)
Less than 3 workers	1.00	0.98	0.84
	(0.00)	(0.13)	(0.36)
Total workers	1.07	1.40	5.07
	(0.26)	(4.32)	(67.83)
Observations	127	90381	99780

Source: Establishment Census (2017)

Table 1: Summary statistics on Caguwa establishments

3 years by the National Institute of Statistics of Rwanda (NISR). Each round includes 100,000 to 200,000 observations. Because used clothing retail cannot be precisely identified from ISIC-4 codes, I use the term $caguwa$, which specifically describes this activity. I access a licensed enumerator-written variable that describes the main economic activity for all rounds, particularly for 2014, the last pre-shock round. Creating an indicator for whether $caguwa$ is explicitly mentioned in an establishment's description serves as a lower-bound estimate for caguwacaguwa retail presence, as enumerators often write "clothing retail" without further details. Therefore, this indicator can only be used under the assumption that, given a firm is $caguwa$, the enumerator specifying writing $caguwa$ in the establishment description is orthogonal to other characteristics, for example, manager sex. Discussions with the NISR confirmed that no specific directions were given for describing the main economic activity related to clothing retail. I create a dummy variable for $caguwa$ appearing in a business' description. I then calculate the ratio of the total number of workers employed in $caguwa$ establishments in a given zone to the total active population of that zone (as per the Housing and Population Census, 2012) at the district level (30 districts):

$$Exp = \frac{\text{Caguwa workers}(EC)_{2014}}{\text{Active population}_{HPC,2012}}$$

Figure 2 shows district-level exposure to the used clothing trade. Exposure is correlated to airports, major cities, and roads, but imperfectly so. The location of sellers, and thus spatial exposure to the shock, is expected to be very polarized for two main reasons. First, used clothing retail is typically concentrated in specific markets (Brooks and Simons, 2012). Second, taste for used clothing is concentrated in urban zones in most countries (Brooks, 2019). To ensure that $caguwa$ intensity does not act as a proxy for other dynamics such as supply chains, regional culture, or smuggling, I include district $\times$ urban fixed effects in all specifications. The results are robust to discretizing the spatial exposure variable, isolating the districts with the highest exposure (dark red), or using a predictor of $caguwa$ to address districts with 0 density[10].

[10]My classifier has a 5% false negative rate (missing establishments where the enumerator wrote $caguwa$) and a 3.5% false positive rate (including establishments where the enumerator did not write $caguwa$). The false positive rate is an upper bound for inclusion error, as some establishments may be caguwacaguwa retailers even if not explicitly noted.

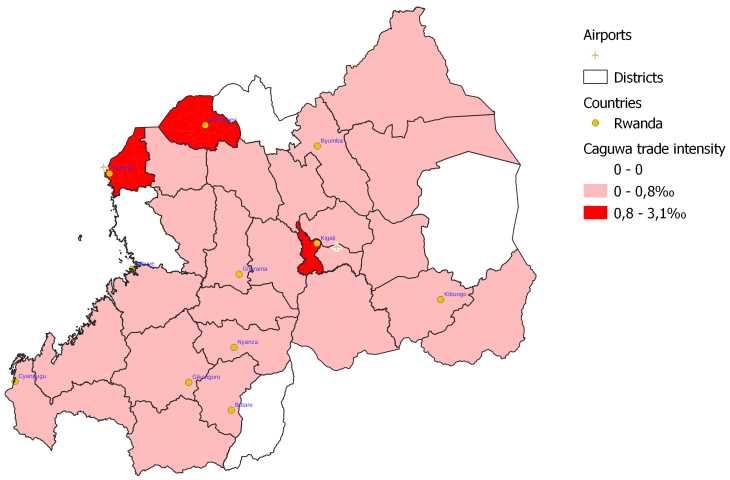

Figure 2: District-level *caguwa* exposure

Individual exposure to *caguwa* and outcomes: the Integrated Household Living Conditions Survey

For the second source of variation and outcomes, I use the 2010, 2013, and 2016 rounds of the Integrated Household Living Condition Survey (IHLCS). This survey is conducted annually from October to the following September and collects data at the job level, covering the entire year leading up to the interview. Each round represents approximately 60,000 individuals (30,000 of working age, accounting for 75,000 jobs) and allows for the linking of spouses and family members. The IHLCS provides detailed information on job status and industry. It also captures earnings and income, with earnings recorded at the job level while total income is at the individual level. Changes in earnings indicate exposure to shocks, whereas tal income reflects resilience—how changes in earnings from one job affect overall individual income from all sources. The survey also quantifies labor supply for each job, including both intensive (hours worked) and extensive (employment status) margins. I also construct a variable for total economic labor during the week. More broadly, the survey contains information on time use, inclusing indicators for market work (working status of each job) and non-market domestic work, and migration, within and across districts.

3 Empirical Strategy

I employ a triple-difference strategy that exploits two sources of variation in shock exposure. The first source of variation is based on living, before the shock, in a region with more exposure to the tariff increase. This approach aligns with the regional effects of shocks literature (Topalova, 2010; Dix-Carneiro and Kovak, 2017; Kovak and Morrow, 2022). When looking at a single-sector shock, however, there is a concern that individuals in less exposed zones may not follow similar trends in earnings, migration, or sectoral reallocation due to regional differences in industry composition. Also, in my household data, I only identify retail workers, not specifically *caguwa* retailers. I thus introduce an additional source of variation: pre-shock independent retail experience. I build a dummy for whether a job is in retail with a start date prior to the June 2016 tariff shock [11]. This triple-difference design relies on the assumption that the trend in the retail-non-retail gap in more exposed zones was parallel to the trend in less exposed zones, across all values of the exposure index

[11] I chose to exclude those who started doing self-employed retail after June 2016, because it is not clear whether they did so knowing about the changed working conditions, and the link between spatial exposure and likelihood of doing *caguwa* could have been different. The results are the same, keeping them in the control group or dropping them

(Olden and Møen, 2022). The baseline estimating equation is:

$$\begin{aligned} Y_{i,j,d,t} =& \alpha + \beta_{\mathbf{1}} \mathbf{Post_t} \times \mathbf{Expo._{d(i,t-1)}} \times \mathbf{IndRetail_{j(i)}} + \beta_2 Post_t \times IndRetail_{j(i)} + \\ & \beta_3 Expo._{d(i,t-1)} \times IndRetail_{j(i)} + \beta_4 IndRetail_{j(i)} + \beta_5 X_{i,d,t} + \gamma_{t,d} + trim_t + \varepsilon_{i,d,t} \end{aligned} \tag{1}$$

For job j of individual i living in district d at time t. $IndRetail_{j(i)}$ is a dummy for a job being an independent retail job with a start date before the shock. $Expo._{d(i,t-1)}$ is the z-score of district-level pre-shock $caguwa$ exposure in the district where the individual lived a year ago. The lag avoids migration-driven reverse causality. $X_{i,d,t}$ are controls including age, student status, rurality, and recent migrant status (excluded in migration equations), education, gender, marital status, role in the household, a dummy for being in sales and another one for being self-employed (excluded in equations on working status and occupational code of jobs). Trimester fixed effects (starting at the dry season in December rather than in January) are included to avoid seasonality-related biases in earnings, migration, and labor outcomes. Time-district fixed effects absorb time-variant district characteristics and alleviate concerns about increasing smuggling in border districts. Standard errors are clustered at retail-job $\times$ district level (or individual, or household, depending on the level of the specification), as the treatment is being a retail job in a district 1 s.d. more exposed to $caguwa$ pre-shock. The coefficient of interest β_1 captures the additional effect of being a retail job in the post period for retail jobs that were one standard deviation more exposed to $caguwa$ trade before the shock - under the assumptions of the model, β_1 is the causal effect of the policy.

First, I analyze the direct effect of the shock on retail jobs: daily and hourly earnings, turnover and non-labor expenditures. Next, I investigate the margins of shock adaptation at both the job and individual levels: for the job-level outcomes, I examine changes in hours worked at the retail job, addressing several margins where potential selective attrition could occur: keeping the retail job, becoming unemployed, and migrating. At the individual level, I examining change of hours at the retail job and in total across the week along several margins for potential attrition - keeping the retail job, going unemployed, and migrating. I adapt Equation 1 to the individual level, where $IndRetail$ indicates whether the individual was a self-employed retail seller within the past year. Using this specification, I analyze hours worked in total during the week, last weekly and hourly income across all earnings sources last week, which indicate resilience to the shock. I also consider total hours worked this week. By examining both weekly and hourly income, I can distinguish between workers who adjust their labor supply (substitution responses) and those for whom the income effect is dominant. Finally, I study household-level consumption, using data from the IHLCS and a similar specification as Equation 1. Here, $IndRetail_i$ indicates whether any household member was a retailer starting before June 2016.

The paper also explores mechanisms through several heterogeneity analyses. I will implement quadruple differences based on gender, marital status, and the presence of a collaborating spouse at the retail firm (paid or unpaid). These heterogeneity analyses will be detailed in their respective sections.

	Log(daily earnings)	*Log(hourly earnings)*	*Log(turnover)*	*Log(non-L exp.)*
Post × IndRetail × Expo	-0.085**	-0.103**	-0.117***	-0.074***
	(0.04)	(0.04)	(0.02)	(0.03)
R-squared	0.471	0.397	0.296	0.267
N	23638	23619	5212	3999
Time-district FE	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 2: Average effects of $caguwa$ shock on retail jobs

4 Main results

4.1 Retailers' exposure to a policy-driven cost shock

Table 2 presents the impact of the policy on retail businesses' earnings, turnover, and expenses. The estimates of the term $Post \times IndRetail \times Expo$ capture the evolution of the independent retail job premium, compared to the trend in this premium in non-intensive areas. The earning premium of independent retail jobs grew 8.5% slower in districts one standard deviation more exposed to $caguwa$ before 2016 (col. (1)). The effect is even more pronounced for hourly earnings, with the growth in the retail premium being 10.3% slower in exposed districts compared to non-exposed districts (col. (2)). The last two columns indicate that the policy's impact on retail earnings was primarily driven by a decrease in the value of sales to end customers (turnover, col. (3)), which was even larger than the decrease in expenditures induced by the price hike in used clothing bales wholesalers (col. (4)).

Discussion of effect size: Is a 10% slower growth in the retail premium of more exposed states a credible effect size? Government estimates[12] indicate a 30% increase in clothing bale prices at the wholesaler level. In the most exposed districts, $caguwa$ retailers represent up to 1/8 of the retail sector (EC 2013). Assuming perfect pass-through and no spillovers[13], the shock would need to induce a 80% relative decrease in our $caguwa$ workers' hourly earnings for the coefficient on the whole of the retail sector to be 10%. Pre-shock estimates from the IHLCS indicate that non-labor costs represent on average 70% of turnover for retailers in exposed areas. If costs have indeed increased by 30%, retailers operating on such narrow margins could have experienced even more drastic reductions in hourly profits[14].

Discussion of effect validity: alternative indexes, pre-trends, spillovers An important concern is that of spillovers. Since the household survey only identifies independent retailers, businesses receiving customers' reallocated demand (e.g., retailers of new clothing), or retailers' reallocated labor hours (e.g., firms that hire displaced workers with more markdown power) could be in the treated group and bias estimates.

[12] Strategy For The Transformation Of Textile, Apparel And Leather Sectors in Rwanda, MINICOM 2022

[13] An exercise below finds that spillovers within retail amplify the effects if anything

[14] a New York Times article also refers to $caguwa$ workers not making enough money to keep doing things on the side anymore, although no precise estimates come of it: "https://www.nytimes.com/2017/10/12/world/africa/east-africa-rwanda-used-clothing.html"

	Log(daily earnings)	*Log(hourly earnings)*	*Log(turnover)*	*Log(non-L exp.)*
Post × IndRetail × ZDE	-0.195***	-0.220***	-0.164***	0.085**
	(0.05)	(0.05)	(0.03)	(0.04)
R-squared	0.471	0.398	0.295	0.267
N	23638	23619	5212	3999
Time-district FE	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓

Table 3: Spillovers estimation - $caguwa/retail$ intensity as spatial index - main results

To estimate the direction of this effect, I use data from the Establishment Census, which provides the size of the $caguwa$ sector within the retail sector. In districts where $\frac{caguwa}{retail}$ is large, the retail sector was more intensely impacted, with limited alternatives for customer demand or displaced $caguwa$ retailers - leaving less space for potential spillovers. To estimate this, I re-estimate Equation 1 using $\frac{caguwa}{retail}$ as the spatial exposure variable in Table 3. If anything, the resulting coefficients on retail jobs earnings, turnover, and expenditures are even larger with this proxy. This suggests that spillovers to other sectors are reducing the observed effect of the policy.

Another concern is that migration or structural transformation may have caused the retail premium in caguwacaguwa-intensive zones to decline even before the shock. To address this, I examine pre-trends in Table 4 using the 2010 wave of the IHLC [15]. Although some effects from 2010 to 2013 are statistically significant, in this case the pre-trends are going to the opposite direction than the 2013 to 2016 coefficient.

	Log(daily earnings)	*Log(hourly earnings)*	*Log(turnover)*	*Log(non-L exp.)*
2010 × IndRet × ZDE	-0.035	-0.066*	-0.096**	-0.098
	(0.03)	(0.04)	(0.04)	(0.09)
2016 × IndRet × ZDE	-0.086*	-0.098*	-0.105***	-0.097**
	(0.04)	(0.05)	(0.03)	(0.05)
R-squared	0.423	0.363	0.308	0.327
N	35384	35218	8429	6953
district_urban FE	✓	✓	✓	✓

* p<0.05, ** p<0.01, *** p<0.001 Expo: Z-score district exposure to caguwa at t-1. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 4: Pre-trends on main results

Finally, differential job or district exit could also bias the estimates of the policy's causal effect. To address these concerns and to examine adaptation strategies, I turn to the examination of these variables.

4.2 Adaptation to the shock: job-leaving, migration, formality, unemployment response

Table 5 presents how workers adapted to the shock. Col. (1) estimates the policy effect on hours worked at the retail job, col. (2) looks presents the log of these hours, col. (3) assesses whether retail jobs are more

[15] this wave is coded differently than the others, and does not have trimester fixed effects. For this reason, I don't run all the specifications with it

	hours/week	*log(hours/week)*	*Kept job*	*Unemployed*	*Migration*
Post × IndRetail × Expo	-0.027	0.002	-0.001	0.002	-0.001
	(0.31)	(0.01)	(0.00)	(0.00)	(0.02)
R-squared	0.230	0.142	0.005	0.047	0.058
N	53429	53429	53459	61001	66232
Time-district FE	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 5: Policy effects on margins of shock adaptation

	log(inc.)	*log(tot hours)*	*log(hourly inc.)*	*log(cons.)*
Post × IndRetail × Expo	-0.064**	0.035***	-0.098***	0.000
	(0.02)	(0.01)	(0.03)	(0.01)
R-squared	0.481	0.158	0.411	0.234
N	29980	53684	29969	27961
Time-district FE	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 6: Individual and household-level consequences of $caguwa$ shock

likely to have ended by the time of the interview. and col. (4) and (5) look at differences in individual-level unemployment and migration rates. There is no response across any of these margins. This result contrasts with evidence of displacement for salaried workers in richer settings and raises the question of why workers, particularly in self-employment, where they should arguably have more control over their hours and business type, are so immobile. The lack of effects on migration matches the literature (Topalova, 2010; Dix-Carneiro and Kovak, 2019; Borusyak et al., 2022), although these results have to be qualified in the light of recent advances (Borusyak et al., 2022) showing that they do not necessarily mean that migration is not a potential reallocation response.

Finally, I turn to individual-level consequences on personal income and household consumption to evaluate the toll of factor immobility.

4.3 Resilience: income, consumption

Table 6 presents estimates of the policy's impact on total income, hours across the week, hourly income, and household consumption. Retailers in districts 1 s.d. more exposed to $caguwa$ pre-shock experienced a 6% slower growth in their overall income across all earnings sources. This occurred despite an increase in hours worked in jobs other than independent retail. Household-level consumption remained stable, suggesting that relatives might have employed mitigation strategies.

The shock also impacted time use, as retailers took on additional occupations to mitigate its effects. Occupational choice outcomes are explored in the Appendix.

5 Theoretical framework

In this section, I build a theoretical framework to interpret my results. I begin with a model of time allocation between leisure, self-employment in retail, and other jobs. The model formalizes a setting where individuals hold multiple jobs: one with a production function (e.g., self-employment) and another for a fixed wage. In this framework, the absence of viable wage employment options means that the net wage (after accounting for search costs) is either negative or below the marginal returns of the last hour worked at the firm, resulting in a corner solution. I explore the implications of having no satisfying employment options outside of self-employed retail for labor supply elasticity in response to a shock. Specifically, I show that a decrease in business total factor productivity (TFP) - how I model the shock given the increase in prices and decrease in turnover documented above - does not necessarily lead to a reduction in hours worked if there are no alternative jobs to substitute into. After presenting suggestive evidence of gendered differences in the quality of available outside options, I test the framework's predictions by examining the shock's effects along two dimensions: gender and living in a high-opportunity area.

I start with a basic setup: the agent is engaged in retail and has a total time budget $\bar{T}$ to allocate between leisure and work. The agent works in retail (job 1) and can potentially work another job (job 0). The retail job earns profit $Ah_1^{\alpha}\iota^{\beta} - g\iota$, where ι represents bales of clothing, and the alternative job earns $h_0 w_o$[16]. Any remaining time is considered leisure. The agent maximizes utility derived from consuming a unitary good with a price of 1, and leisure.

$$\underset{h_0,h_1,c,\iota}{max}\ c^{\theta_c}(\bar{T} - h_0 - h_1)^{\theta_l}\ \ st\ \ c = w_0 h_0 + Ah_1^{\alpha}\iota^{\beta} - g\iota, \bar{T} \geq h_0 \geq 0, \bar{T} \geq h_1 \geq 0, c \geq 0, \iota \geq 0 \qquad (2)$$

With $0 \leq \alpha + \beta \leq 1$ and $0 \leq \alpha, \beta \leq 1$. Solving for the first order conditions with no corner solution leads to equating marginal utilities at each job $w_0 = A\alpha h_1^{\alpha-1}\iota^{\beta}$. The ratio of inputs used in the production function $\frac{h_1}{\iota}$, depends on the price of bales, the shadow price of labor and their relative productivity $\frac{g\alpha}{wo\beta}$. Solving the model for labor at the firm yields

$$h_1 = g^{\frac{-\beta}{1-\beta-\alpha}} \frac{\alpha(\frac{1}{\beta})^{\frac{\alpha-1}{1-\beta-\alpha}}(\frac{w_0}{\alpha})^{\frac{\alpha}{1-\beta-\alpha}} A^{1-\beta-\alpha}}{w_0\beta}, \frac{\delta h_1}{\delta A} = \frac{1-\beta-\alpha}{A} \times h_1$$

. Under our assumption of decreasing marginal returns at the firm, workers will reduce the amount of time they put into the firm as A decreases. However, in our setting, many workers may be excluded from wage labor, meaning the marginal value of one hour of their work is not anchored to the market. To predict how such workers respond to shocks, I introduce a modified model where there is no alternative job ($h_0 = 0$). This

[16] I don't account for the fact that workers can leave their self-employed retail job, which they never do in the results. This is equivalent to saying that the first unit of work in retail is always more profitable than an hour of wage w_0

is conceptually similar to a separation failure like those discussed by Kaur (2019), and replicates scenarios with extremely low-paying wage options or very high search costs. Let us consider this model :

$$\begin{aligned} \max_{c,h,\iota} \; & c^{\theta_c}(\bar{T}-h)^{\theta_l} \; s.t. \; c = Ah^{\alpha}\iota^{\beta} - g\iota \\ & \bar{T} \geq h \geq 0, \iota \geq 0, c \geq 0 \end{aligned} \tag{3}$$

Using the same production function, the value of work is not pinned to w_0 if there is no wage option. Solving the model yields $h = \frac{\bar{T}\Theta\alpha}{1-\beta+\Theta\alpha}$ with $\Theta = \frac{\theta_c}{\theta_l}$ and $Q = Ah^{\alpha}\iota^{\beta}$. $\frac{\delta h}{\delta A} = 0$ While simplistic, the model rationalizes the absence of responses observed in the results. It also generates some useful predictions as to the ways agents will adjust their labor supply depending on the availability of outside wage options. This framework can be extended to include an outside self-employment option, reallocation costs, lower employment options, or consumption floors. The model predicts that labor supply responses to a productivity shock at a self-employed worker's job will depend on consumption floors and outside options. If consumption is binding and no outside options exist, a negative labor supply elasticity may arise. Conversely, when agents have outside employment options, labor supply at the firm will decrease, while labor supply at other jobs will increase. At the extensive margin, agents with more outside options are more likely to take on another job following a negative productivity shock.

I test the validity of these predictions, focusing on two populations for whom wage work is relatively less available: women and workers in low-opportunity areas. Below, I map the model to the data with the help of descriptive evidence and literature.

5.1 Descriptive evidence on gendered outside options in the labor market

Insights from the literature on gender-dependent market power Two facts describe the working environment in which most working women of the developing world operate: a universal over-representation in self-employment, and yet, larger income gender gaps in self-employment gaps there than in any other working status (Heath et al., 2015). I explore the causes for this gap by providing descriptive evidence of women's limited access to salaried employment opportunities and their higher concentration in self-employed occupations within industries, following closely Hardy and Kagy (2020). In the context of my framework, I conclude that women have fewer outside employment options than men. Testing for this heterogeneity can serve as a test for the importance of outside options in shapin glabor responses.

The framework predicts that a relative lack of outside options could limit workers' ability to transition to other occupations. This mechanism is illustrated in Sharma (2023), where men salaried textile workers in Brazil were more likely than women to exit when wages decreased exogenously. Hardy and Kagy (2020) find that lower market power make women less able to take advantage of exogenous price increases in the good that they produce. Building on these insights, I will first present descriptive statistics showing that self-employed women operate in fewer industries (cross-industry concentration) and that the industries they do operate in are more crowded (within-industry concentration) compared to self-employed men, closely following Hardy and Kagy (2020). I will then empirically test the importance of these outside options in shaping shock adaptation trajectories.

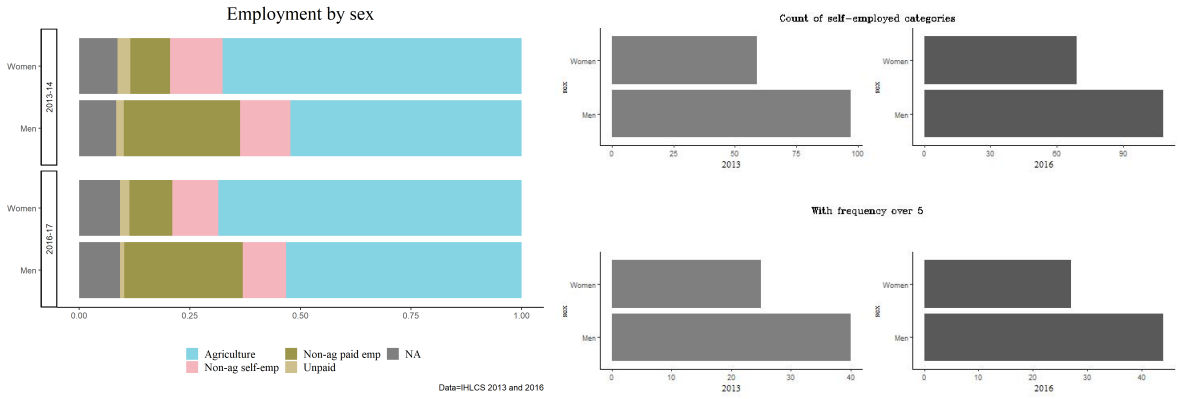

Figure 3: Type of and number of self-employment categories declared by sex (2013-2016)

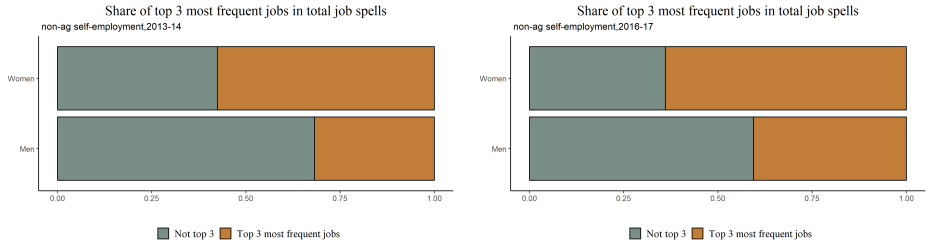

Figure 4: Share of self-employment obs held in top 3 occupations, by sex

Descriptive evidence on gendered within- and cross-industry concentration The structure of employment differs greatly by gender, primarily due to lower access to paid non-agricultural employment (Figure 3). This can be explained by hiring discrimination (Heath et al., 2015), greater time constraints (Dinkelman and Ngai, 2021), or other barriers. In Rwanda, the share of men and women in non-agricultural self-employment jobs is comparable. However, when looking at the variety of these jobs, in terms of the number of ISIC3 classifications declared (Figure 3), it appears that women operate in fewer occupations than men. This difference is even more pronounced when considering occupations where more than five women or men report working. The limited number of firms within an industry providing suitable jobs is characterized in Sharma (2023) as a within-industry concentration, and the limited number of industries providing these jobs is defined as cross-industry concentration. In Rwanda, self-employed men outside of agriculture declared almost 100 occupations (resp. 40 with more than 5 men) in 2013, while only 55 (resp. 25) industries were cited by women (Figure 3). This suggests that factors such as customer discrimination, skills mismatch, or other entry barriers may prevent women from accessing certain occupations, even if self-employed. This result is constant across time and holds true for wage jobs, suggesting that women have fewer suitable outside employment options regardless of job status.

Beyond being kept in a few sectors, women work in more crowded ones. Figure 4 illustrates that more than 50% of women's non-agricultural self-employed job spells are concentrated in just 3 industries [17]. In 2013, women operated in sectors where, on average, 783 other people worked, compared to 556 for men. By

[17] These industries are, in order, retail sales via stalls and markets, retail sales not in stores, stalls or market, and wholesale of food, beverages, and tobacco, with retail sales of food, beverages, and tobacco also being a predominant industry in 2016.

	log(earnings)	log(earnings/hour)	hours/week	still working	no job	log(tot. inc.)
Post × IndRetail × Expo	-0.008	0.004	-1.897***	0.001	-0.004	-0.001
	(0.02)	(0.03)	(0.58)	(0.00)	(0.00)	(0.02)
Post × IndRetail × F × Expo	-0.147***	-0.198***	3.379***	-0.003	0.014**	-0.104**
	(0.05)	(0.04)	(0.76)	(0.00)	(0.01)	(0.05)
R-squared	0.475	0.402	0.233	0.006	0.052	0.484
N	23638	23619	53429	53459	61001	29980
Time-district FE	✓	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 7: Heterogeneity on gender - shock exposure, adaptation, and resilience

2016, these numbers were respectively 858 and 577.

This gender difference in the availability of suitable occupations implies that a given shock will lead to differing hour responses by gender. Specifically, women may not reallocate as quickly. I will now examine gender heterogeneity results and test my model's predictions.

6 Ability to reallocate away from a shock-affected job: outside options

6.1 Outside options and gender

Table 7 presents the result of our heterogeneity analysis on gender. There are two ways of interpreting these results: $Post \times IndRetail \times Expo$ is the effect of being a man retailer in a zone 1 s.d. more exposed to $caguwa$ before the shock, and $Post \times IndRetail \times F \times Expo$ captures the additional effect for women retailers. Alternatively, the difference between $Post \times IndRetail \times F \times Expo$ and $Post \times IndRetail \times Expo$ is the effect on women retailers in exposed areas compared for women retailers in less exposed areas. Since $caguwa$ retail is an occupation in which women are over-represented, they may be disproportionately affected by the shock. This could introduce a gender composition effect, which is netted out in the latter interpretation.

In line with the framework's predictions, women exhibit less labor elasticity to the productivity decrease. By the time of the interview, the effect on men's earnings becomes insignificant (coef. 1, col. 1-2). This is likely due to men's hour response in the context of decreasing marginal returns, or to lower exposure to the shock. While men retailers react to the shock by decreasing hours put into the retail job (coef. 1, col. 3), women's hours retail premium at grows by 1.5 hours more in districts 1 s.d more exposed. Another important result is that while women are relatively more likely to become unemployed, there are no differential trends in the extent to which workers leave their $caguwa$ job (col. 4). However, these reallocation choices have persistent negative consequences, as women earn less than men and less exposed women retailers, even a year after the reform (col. 6).

I explore the types of jobs women are abandoning in Table 8 and Table 9. Although I focus on the main job of the week, results are constant across all jobs, including secondary employment. Consistent with

the gender inequality in outside options, women's reallocation strategies involve abandoning unpaid jobs to free up time for their retail jobs. In contrast, men adapt by taking advantage of other paid opportunities. Observed formality increases for both genders, as women tend to increasingly have a potentially declared self-employed main job of the week rather than being unpaid family workers. In contrast, men's observed formality increases because they take up wage jobs, highlighting the importance of distinguishing between different formality types, especially in settings where declaring self-employed activities is not costly.

	Main job of the week					
	W(f)	W(nf)	Unp. fam.	Formal	Retail	Sales, no ret.
Post × IndRetail × F × ZDE	0.004	-0.006	-0.028*	0.007	-0.012	-0.003**
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Post × IndRetail × ZDE	0.006	0.007	0.006	0.014**	0.017*	0.005***
	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
R-squared	0.074	0.230	0.183	0.204	0.433	0.013
N	71665	71665	71665	71766	71766	71766
Time-district-sex FE	✓	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 8: Reallocation of workers across genders - occupational choice

While these results align with descriptive evidence of women's limited outside options in Rwanda and the framework, other factors could also explain why policy effects differ by gender. For instance, women may have less education for alternative opportunities or face greater time constraints due to being the sole breadwinners in their households. In subsection B.1, I explore these two channels by interacting with explanatory variables. The results remain consistent: women's earnings and income are more exposed to the shock than men's. Hours responses are gendered, but driven by women with at least a primary school diploma, and the negative effects of the shock on overall income are driven by workers who belong to households with other breadwinners, consistent with the idea that income effects are driving the observed hours responses.

Still, norms about women working outside the household or other factors besides outside options could

	No job	Tot.hrs/job	Av. duration	Paid jobs/week	Jobs/w
Post × IndRetail × F × ZDE	0.014**	3.362***	0.162	-0.009	-0.048***
	(0.01)	(0.80)	(0.11)	(0.01)	(0.02)
Post × IndRetail × ZDE	-0.004	-1.030	0.120	0.025**	0.022
	(0.00)	(0.71)	(0.11)	(0.01)	(0.02)
R-squared	0.052	0.230	0.373	0.233	0.240
N	61001	42004	71766	71766	66232
Time-district-sex FE	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 9: Reallocation of workers across genders - extensive margin

	Hourly earnings, j	*Hours, j*	*log hours*	*log inc., all jobs*	*log(tot.hours)*
Post × IndRetail × ZDE	-0.451	7.800	0.358**	-0.199	0.194***
	(0.56)	(5.31)	(0.16)	(0.22)	(0.06)
Post × IndRetail × F × ZDE	-0.532	-2.665	-0.148	-0.055	-0.012
	(0.66)	(5.04)	(0.23)	(0.25)	(0.10)
Post × IndRetail × high_opportunity × ZDE	0.465	-11.163**	-0.437**	0.188	-0.240***
	(0.56)	(5.35)	(0.16)	(0.22)	(0.07)
Post × IndRetail × F × high_opportunity × ZDE	0.326	7.092	0.230	-0.060	0.104
	(0.66)	(5.16)	(0.24)	(0.25)	(0.10)
R-squared	0.17	0.15	0.09	0.27	0.12
N	23627	53473	53473	29969	53684
District-Time FE	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 10: Heterogeneity on living in a high-opporutnity area

explain the results. To strengthen this explanation, Iconduct a second decomposition based on the geographical distribution of job opportunities.

6.2 Outside options and local wage employment opportunities

In this section, I split the districts of Rwanda in two: those with fewer than the mean number of wage jobs represented in the whole district (50 different wage occupations in the IHLCS pre-shock) and those with more. The rationale behind this decomposition is that, while self-employment is available everywhere, wage jobs depend on firms providing them. In Rwanda, the availability of wage jobs is highly spatially polarized, even in districts with some $caguwa$ retail presence. To check whether these areas behave in line with my framework, which predicts lower reactivity to a given shock on earnings when there are fewer options available, I decompose the policy effect by gender and by whether one lives in a high-opportunity area.

Table 10 presents the results of decomposing policy effects by gender and local outside options. I focus on analyzing hourly responses, as hourly earnings incorporate adjustments in terms of hours worked. Workers in low-opportunity areas increased their hours regardless of their gender (col (2) and (3)). I contrast, all workers in high-opportunity districts, especially men, substituted away frmo their retail jobs.

This additional test confirms that outside options play a critical role in determining how policy impacts self-employed workers. However, women remain less elastic to the productivity decrease, even in high-opportunity districts. This suggests that other mechanisms may compromise women's adaptation strategies, which I explore further in the next section.

7 Intra-household margins of adaptation and ability to mitigate shock exposure

Firms have greater decision-making power than salaried workers in determining whether a given productivity shock translates into an hourly earnings shock. They can adjust product quality, sourcing strategy, variety, or their factor mix. In our setting, an aspect of within-firm adaptation to a shock may occur at the level of the household through family labor. This is confirmed by a heterogeneity analysis of the impact of the shock based on whether an individual has a spouse or partner - In_couple_i for conciseness.

	Earnings, job-level	*Earnings/hr, job-level*	*Hours, job-level*	*Inc., all jobs*
Post × IndRetail × ZDE	-0.089*	-0.109	-1.262	-0.056
	(0.05)	(0.07)	(1.09)	(0.04)
Post × IndRetail × F × ZDE	0.027	-0.038	4.111***	0.018
	(0.05)	(0.06)	(1.12)	(0.04)
Post × IndRetail × in_couple=1 × ZDE	0.105	0.164**	-1.549	0.046
	(0.07)	(0.08)	(1.11)	(0.06) *
Post × IndRetail × F × in_couple=1 × ZDE	-0.214**	-0.187	-1.050	-0.124
	(0.10)	(0.11)	(1.04)	(0.08)
R-squared	0.35	0.30	0.23	0.35
N	23638	23619	53429	29980
District-Time FE	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓

p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndTr/SpouseTr = indiv./spouse in retail × self-emp. × start date < 06/2016. SE clustered at the district*indiv/spouse treat level

Table 11: Heterogeneity analysis on having a spouse

Table 11 presents the heterogeneity analysis on shock exposure, adaptation, and resilience. The earnings premium for single men's independent retail jobs grew 8.9% slower in districts 1 s.d. more exposed to $caguwa$. Importantly, when accounting for trade policy effects by marital status, gender inequality disappears for single workers; the shock negatively impacted single workers' earnings ($Post \times IndRetail \times Expo$), regardless of gender (no additional effect on single women through $Post \times IndRetail \times F \times Expo$). This negative effect is mitigated for married men ($Post \times IndRetail \times In\_couple \times Expo$), although significant only at the 12% level in the earnings equation. However, marriage does not benefit women as much as men (negative point estimates on $Post \times IndRetail \times F \times In\_couple \times Expo$, significant for earnings and significant at the 10.1% level for hourly earnings). Importantly, adaptation strategies remain consistent, with all women exhibiting Giffen-good like labor supply responses to earnings decrease. Marriage modifies men's shock exposure but does not change their outside options or adaptation strategy to a given hourly earning decrease.

In subsection C.1, I check that the differential effect of having a spouse is not driven by positive selection on wealth for married individuals. Further interaction with education does not eliminate the negative effect on single retailers' hourly earnings or the positive effect on married men retailers' earnings.

In the context of a trade-driven negative productivity shock on a self-employed labor market, married individuals drive most of the gender inequality in shock exposure. This result raises the question of what men gain from marriage that women do not. The following section explores several hypotheses to explain why men might gain more firm protection from marriage.

7.1 Domestic-market labor porosity - testing th insurance value of spousal unpaid labor

Several factors may explain why men in independent retail benefit from marriage differently than women. Descriptively, marriage is correlated with a 40% increase in domestic work hours for women and a 30% decrease for men. Business structures also differ significantly by gender for married individuals. Married women are more likely to work alone (80% of married women's businesses versus 70% for men) and much less likely to receive unpaid help from their spouse (5% businesses, resp. 19% for men). The results in Table 11 differ from standard added worker effects, as hourly earnings of the individual are protected and not just household consumption. Below, I discuss how spouses can insure against risk at an individual's firm, and how this would show in Table 11. The plausible explanations form the basis for an extension of the model in section 5 which I build and test.

First, having a spouse allows for larger specialization in either economic or domestic work. This would matter in the event where no worker has any employment alternative, but men can put in more hours in their declining retail job to preserve consumption because of fewer domestic duties. However, the results in Table 11 indicate that married men decrease their hours without suffering an hourly earnings shock.

Second, spouses can provide additional work at an individual's firm, which can be particularly valuable when hiring external firm labor is hard, costly or associated with principal-agent problems. However, there is no clear reason why workers would need to hire more labor in a setting where labor productivity has decreased. Nonetheless, women often operate as unpaid family members (20% of men's businesses in Rwanda in 2013 and 2016), which could affect the observed earnings and productivity of their husbands. For this reason, I will use spousal-linked data that includes unpaid labor, to test whether spousal labor increases at men's firms. One note is that this accounting artifact does look like productivity smoothing in a regression, but households would still be aware of the opportunity cost of the wife's unpaid labor at the firm. Without a household bargaining dimension, there is thus no reason why a household that benefits from unpaid productive work should make different time allocation decisions than one with paid productive work. Unpaid and paid labor trajectories will be examined separately in the regressions, but not conceptually in the unitary model.

Finally, spouses could contribute to firms in other ways than productive labor. In settings with small firms and high porosity between domestic and economic labor, spousal domestic work could enhance firm productivity differently from an added hour of labor. For example, spouses might help gather customers, prepare goods, or allow workers to operate during more profitable hours. If women are more available to provide this type of labor and do so in a countercyclical manner, it could explain the observed results.

Two factors could explain the gender inequality in married workers' protection against shocks: increases in spouses' unpaid work, which is more common among women, or increases in productivity-enhancing la-

bor, which women might be more available to provide. These strategies have insurance value for the firm. I develop an extended model in section 5 to determine which dimension of spousal insurance protects married men against shocks.

Setup: two individuals, m and f, operate within a unitary household, maximizing utility from each member's leisure and joint consumption. I model that available spouses can provide domestic work and protect the firm against productivity declines. The framework relates such spousal insurance to a standard insurance product. Firms have risk-exposed productivity: their production function is

$$A^*(h_1^m)^\alpha(h_1^f)^\gamma\iota^\beta$$

And $A^* = A$ with probability $(1-\pi)$ and $\underline{x}A < A$ with probability π. The insurance product is spousal productivity-enhancing labor, which only makes A^* decrease to $\bar{x}A > \underline{x}A,\ \bar{x}A \leq A$. We do not observe productivity-enhancing labor, but we know that such labor is mostly home-based and requires spousal flexibility. I thus model the price of the insurance product as choosing not to seek, or do, a wage job outside of the house. I model it as a choice for the non-firm owner spouse between working in the domestic sector $s = d$, earning the consumption-equivalent wage w_d and granting the family firm insurance against productivity shocks, or choosing the wage work sector, $s = 0$, earning w_0. The insurance price is the opportunity cost of wage work. Both spouses can always choose to allocate work, h_1^f and h_1^m to the firm[18]. With men as the owner spouses, the program looks like this:

$$\begin{aligned}\max_{S,h_s^f,h_0^m,h_1^m,h_1^f,\iota,c} c^{\theta_c}(l^f)^{\theta_l}(l^m)^{\theta_l}\ s.t.\ c = w_0^m h_0^m + w_s^f h_s^f + A^*(h_1^m)^\alpha(h_1^f)^\gamma\iota^\beta - g\iota,\\ 0 \leq h_s^f, h_0^m, h_1^m, h_1^f \leq 1\\ h_0^f + h_1^f + l^f = 1, h_0^m + h_1^m + l^m = 1,\\ A^* \sim B(s), P(A^* = A) = 1-\pi, P(A^* = x_s A) = \pi\end{aligned}$$

In this setting, the sectoral shock represents an instance of risk realization. As hourly earnings responses encompass hours responses, I will use men's firm hours responses to validate the model's predictions and estimate the firm-specific insurance value of spouses being off the wage labor market. Solving the model provides an expression for a man's labor at the firm, denoted as h_1^m, and illustrates how it varies with productivity:

$$\begin{aligned}h_1^m &= (\frac{g}{\beta})^{\frac{\beta}{X}}(\frac{\alpha}{w_0^m})^{\frac{\beta+\gamma-1}{X}}(\frac{\gamma}{w_0^f})^{\frac{-\gamma}{X}}(A^*)^{\frac{-1}{X}}\\ \frac{\delta h_1^m}{\delta A^*} &= \frac{-1}{X}(\frac{g}{\beta})^{\frac{\beta}{X}}(\frac{\alpha}{w_0^m})^{\frac{\beta+\gamma-1}{X}}(\frac{\gamma}{w_0^f})^{\frac{-\gamma}{X}}(A^*)^{\frac{-\beta}{X}} > 0\end{aligned} \tag{4}$$

$X = \alpha + \beta + \gamma - 1 \leq 0$ Labor responses to the sectoral shock depend vary with women's occupational choice through A^*, which diminishes less if women take on the role of insurance, and w_s^f, the sector-specific

[18]Here, the original firm owner never leaves the firm. The non-owner spouse does not leave the firm in the model for conciseness, but in the empirics, I separate workers who work alone and those who work with their spouse.

wage earned by women.

$$\begin{aligned}\frac{\delta h_1^m}{\delta A^* \delta w_s^f} &= \frac{-\gamma}{(X)^2}(\frac{g}{\beta})^{\frac{\beta}{X}}(\frac{\alpha}{w_0^m})^{\frac{\beta+\gamma-1}{X}}(\gamma)^{\frac{-\gamma}{X}}(w_s^f)^{\frac{1-\alpha-\beta}{X}}(A^*)^{\frac{-\beta}{X}} < 0 \\ \frac{\delta h_1^m}{\delta A^* \delta A^*} &= \frac{\beta}{X^2}(\frac{g}{\beta})^{\frac{\beta}{X}}(\frac{\alpha}{w_0^m})^{\frac{\beta+\gamma-1}{X}}(\frac{\gamma}{w_0^f})^{\frac{-\gamma}{X}}(A^*)^{\frac{-2\beta-\alpha-\gamma+1}{X}} > 0\end{aligned} \tag{5}$$

Men's labor is increasing with productivity, but concave in productivity and women's wage. This means that when productivity decreases, men belonging to households where $S = d$ reduce their working hours if and only if the gain in risk protection from $s = d$ counterbalances the effect of women earning smaller wages (in cases where $w_w > w_d$) on the household's initial time allocation and shock reaction. Below is the condition under which, faced with a negative productivity shock, men with spousal-delivered TFP insurance will reduce their hours less than the others.

$$\begin{aligned}&\Delta_d - \Delta_w > 0 \Leftrightarrow Y(w_d^f)^{\frac{\gamma}{X}} A^{\frac{-1}{X}}(\bar{x}-1)^{\frac{-1}{X}} - Y(w_0^f)^{\frac{\gamma}{\beta-1}} A^{\frac{-1}{X}}(\underline{x}-1)^{\frac{-1}{X}} > 0 \\ &\Leftrightarrow (w_d^f)^{\frac{\gamma}{X}}(\bar{x}-1)^{\frac{-1}{X}} > (w_0^f)^{\frac{\gamma}{\beta-1}}(\underline{x}-1)^{\frac{-1}{X}} \\ &\Leftrightarrow \omega(\bar{x}-1)^{\frac{-1}{X}} > (\underline{x}-1)^{\frac{-1}{X}}\end{aligned} \tag{6}$$

$Y = (\frac{g}{\beta})^{\frac{\beta}{X}}(\frac{\alpha}{w_0^m})^{\frac{\beta+\gamma-1}{X}}(\gamma)^{\frac{-\gamma}{X}}$, $\omega = (\frac{w_d^f}{w_0^f})^{\frac{\gamma}{X}}$. Observing that men's labor at the firm does not decrease as much when the shock hits and their wives chose to not integrate the wage labor market implies that the gains in protection at the firm outweigh the loss in wages from outside jobs. This indicates that spousal insurance through productivity-enhancing domestic work dominates in explaining why married men are better protected from the sectoral shock compared to others:

- **Prediction 1 -** If the gains in protection from productivity volatility, χ, are sufficient to offset potential losses from foregoing wages from outside work, ω, then following a sectoral shock, worker whose spouses do not work or seek work outside will reduce hours at the firm less ($\Delta_0 - \Delta_1 > 0$).

7.2 Mapping the framework the spousal-linked data - variable and empirics

When mapping this prediction to the data, it is important to consider that there is selection in who we observe as having a wage job - not all job-seekers secure employment, and we only see workers who accepted good offers. Therefore, I use the status of spouses as paid collaborators at the worker's business as a proxy for their integration into the outside labor market. The likelihood of spouses having a job, particularly a paid one, is closely linked to their role at the family firm. Spouses who are not involved in the family business during the year are more likely to be unemployed or inactive during the week of the interview: 34% of them are in this situation, compared to only 19% of women who are paid collaborators at their husband's firm and 17% of unpaid collaborators. The latter are much less likely to have a wage job (3% versus 10% for paid collaborators, 12% for uninvolved spouses). In summary, women who collaborate for pay are much more likely than the rest to have an own-income-generating main occupation of the week (wage + self-employed) 35% of uninvolved spouses, 54% of paid collaborators, and 20% of unpaid collaborators). Therefore, I

consider a paid collaborator position in the firm an indicator lower availability for spouse-delivered firm insurance work.

Returning to the framework, the expectation is that the type of insurances put into place will depend on spouses status in the firm: working there either for pay or no pay will enable spouses to contribute productive labor to the firm. However, their availability to perform productivity-enhancing work (being either an uninvolved spouse or an unpaid collaborator) will enable spouse to protect firm TFP against risks. The empirical analysis will compare these three status within married business owners to identify the channels through which married men are advantaged in adapting to shocks.

Fine-level data allows me to categorize business structure based on spousal status at the firm. I use the IHLCS and link spouses, creating an indicator for whether a firm owner's spouse declares to never be working in their ISIC during the year (uninvolved spouse), to be working in their ISIC as an independent worker (paid collaborator) or as an unpaid family worker (unpaid collaborator). This distinction helps differentiate between the effects of having a spouse for earnings diversification and domestic work, having a collaborating spouse who is paid, and the value of unpaid spousal productive work. Simultaneously, I observe time use in domestic work and outside work. Since benefiting from paid or unpaid productive help is specific to business owners, I take the baseline regression to the married business owners subsample, estimating:

$$\begin{aligned} Y_{i,d,t} =& \alpha + \beta_{\mathbf{1}}\mathbf{Post_t} \times \mathbf{Expo._{d(i,t-1)}} \times \mathbf{IndRetail_i} + \beta_{\mathbf{2}}\mathbf{Post_t} \times \mathbf{Expo._{d(i,t-1)}} \times \mathbf{IndRetail_i} \times \mathbf{HasPaidHelp} + \\ & \beta_{\mathbf{3}}\mathbf{Post_t} \times \mathbf{Expo._{d(i,t-1)}} \times \mathbf{IndRetail_i} \times \mathbf{HasUnpaidHelp} \\ & + \beta_4 Post_t \times IndRetail_i + \beta_5 Post_t \times HasUnpaidHelp_i + \beta_6 Post_t \times HasPaidHelp_i + \\ & \beta_7 Expo._{d(i,t-1)} \times HasPaidHelp_i + \beta_8 Expo._{d(i,t-1)} \times HasUnpaidHelp_i + \beta_9 HasUnpaidHelp_i + \\ & \beta_{10} HasPaidHelp_i + \beta_{11} IndRetail_i + \beta_{12} X_{i,d,t} + \gamma_{t,d} + trim_t + \varepsilon_{i,d,t} \end{aligned} \tag{7}$$

The coefficients in bold are the coefficients of interest - β_1 is the effect of being a married independent retailer in an area 1 s.d. more exposed to $caguwa$ before the shock, compared to married non-retail business owners: it is a translation of our baseline equation to the married business owner subsample [19]. β_2 is the additional effect of the shock on retailers whohave a paid collaborating spouse, compared to working alone. β_3 is the additional effect for workers who have an unpaid collaborator, compared to working alone. I estimate this equation separately for men and women. The controls and clusters are unchanged. The assumption is that within each category, the retail premia (the difference between self-employed married retailers and other self-employed married businessmen) should not have varied differently from exposed to non-exposed districts.
Additionally, I estimate a complementary equation on spouses of business owners, using whether a spouse was a paid -$IsPaidHelp$ - or an unpaid - $IsUnpaidHelp$ - collaborator to explore how spouses adapt to their business-owning spouses' shock. For this set of equations, I consider earnings, hours and income, and add domestic work variables, from the IHLCS[20].
We expect from the model that if spousal productivity-enhancing domestic work plays a significant role in

[19] In subsection C.2, I show proof that the previous results from the paper also work in this subsample of married business owners - the sign and significance level of our coefficients does not change compared to our baseline specification.

[20] The variables for chores on the 2013 and the 2016 round are not the same, except for cooking. While there is no reason to think that this change in categories would lead to different effects in married women depending on pay status and district, taking only the variables that are on both waves does not change the results either.

	Men self-emp retailers				*Women self-emp retailers*			
	log(earn)	log(earn/hr)	hrs/wk	log(hrs/wk)	log(earn)	log(earn/hr)	hrs/wk	log(hrs/wk)
2016 × IndRetail × Expo	-0.030	0.044	-2.689***	-0.070**	-0.095***	-0.154***	0.102	-0.049**
	(0.05)	(0.05)	(0.75)	(0.03)	(0.03)	(0.03)	(0.43)	(0.02)
2016 × PaidHelp × IndRetail × Expo	-0.405**	-0.461***	-3.777	-0.056	-0.128	-0.195	2.596	0.212**
	(0.15)	(0.13)	(4.44)	(0.12)	(0.13)	(0.19)	(2.44)	(0.09)
2016 × UnpaidHelp × IndRetail × Expo	0.201	0.061	2.194	0.081	-0.120	-0.132	1.742	0.035
	(0.17)	(0.17)	(2.50)	(0.07)	(0.19)	(0.30)	(5.86)	(0.27)
R-squared	0.300	0.272	0.301	0.279	0.279	0.235	0.357	0.342
N	4288	2963	3176	3176	3542	2159	2425	2425
district*Post FE	✓	✓	✓	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndTr/SpouseTr = indiv./spouse in retail × self-emp. × start date < 06/2016. SE clustered at the district*indiv/spouse treat level

Table 12: Heterogeneity of shock effect by intra-familial business structure - affected workers

how households adapt to a given shock, labor decreases will be larger for men whose wives are paid at the business than for those whose wives are not paid or not involved. However, the empirical analysis also considers other intra-familial insurance margins. If households mitigate shocks through extra market work, it compensates for consumption losses but not earnings losses at the firm. Working more hours at the firm for pay could mitigate total earnings losses but at the cost of more hours, without limiting productivity losses. Unpaid work at the firm will be reflected in spouses' hours in retail. I will address each of these points in the results below.

7.3 Affected retailers and spousal participation in the firm

Table 12 show the causal effect of the policy on earnings and labor supply. All married women business owners experience hourly earnings decreases compared to retail business women in less exposed areas, matching previous findings. Notably, only men who work with their spouses under equal status suffer the same negative earnings effect. This suggests that spouses opting out of the wage labor market influences self-employed shock adaptation more than spouses being present at the firm.

With respect to the spousal availability and insurance hypothesis, point estimates indicate that men working with paid help decrease hours worked at the firm (col (3) + (4), coefs 1 + 2) compared with men working with unpaid help (col 1 + 3) or men working alone (1). However, the coefficients are not significant, offering this explanation only limited support. This could be due to men retailers benefiting from paid help having limited jobs to reallocate to, or the precision of the proxy for spouses opting out of the labor market. To gain more insight and examine the other hypothesis, spousal added unpaid hours at the business, I now examine the responses of spouses of affected retailers.

	Men married to self-emp retailers				*Women married to self-emp retailers*			
	log(hrs chores)	hrs retail	log hrs retail	No job	log(hrs chores)	hrs retail	log hrs retail	No job
2016-17 × SpouseTr × Expo	-0.125**	-0.870	-0.036	0.001	0.058***	0.771	0.000	0.005
	(0.05)	(0.71)	(0.03)	(0.01)	(0.02)	(0.96)	(0.04)	(0.01)
2016-17 × HelpsPaid × SpouseTr × Expo	0.267**	-0.630	0.042	-0.025	-0.086	-3.416	-0.046	-0.023
	(0.12)	(4.03)	(0.12)	(0.02)	(0.09)	(5.82)	(0.22)	(0.02)
2016-17 × HelpsUnpaid × SpouseTr × Expo	2.392	0.407	0.010	-0.001	0.040	-4.072***	-0.188***	0.045***
	(1.95)	(2.57)	(0.12)	(0.02)	(0.05)	(1.32)	(0.07)	(0.01)
R-squared	0.171	0.259	0.232	0.065	0.430	0.253	0.189	0.138
N	1451	4470	4470	3450	3851	4872	4872	3931
district, urban FE	✓	✓	✓	✓	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓	✓	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female.
IndTr/SpouseTr = indiv./spouse in retail × self-emp. × start date < 06/2016. SE clustered at the district*indiv/spouse treat level

Table 13: Heterogeneity of shock effect by intra-familial business structure - spouses of affected workers

7.4 Spouses of affected retailers

Table 13 presents results on spouses of affected retailers. First, I examine the causal effect of the shock on spousal domestic labor using time-use variables from the household survey. The findings reveal contrasting responses by gender: while all wives of self-employed retailers increase their domestic work hours in response to the shock, husbands decrease them, except for those working at the family firm with their wives under equal status. This increase in domestic work for wives comes at the expense of stopping work at the family firm and higher unemployment rates for unpaid wives (coef. 1+3, col 6-8). Paid wives, however, continue working at the firm, do not reduce their hours, and do not increase domestic work as much, although this coefficient is imprecisely estimated.

These results contrast with one of our proposed channels - that married men resist productivity shocks better because their wives increase unpaid productive labor at the family firm. Instead, the findings suggest that domestic laborhelps the firm resist shocks, and more available spouses increase their domestic labor supply, even if it means reducing unpaid productive labor at the firm.

The results also suggest that intra-household shock adaptation strategies depend on outside options. Workers and their spouses adapt to shocks by either increasing domestic production or market work. Which margin they choose depends on their access to each of these markets: wives, who have fewer outside options, increase domestic work. Husbands of similarly affected wives decrease their domestic work input and might increase market labor, as shown by a slight hourly earnings increase for unaffected husbands of retailers. The only category of wives who do not increase domestic labor following the shock are those with paid work options—wives who have their own paid businesses. For these women, domestic work does not increase as much and is partly offset by an increase in their husbands' domestic work.

7.4.1 Discussion of alternative explanations for the role of spousal status

The results suggest that more available wives - those who do not work for pay at the family firm - protect their husbands' businesses by increasing their domestic labor supply, allowing them to remain at the firm for

longer than the rest (although this last coefficient is imprecisely estimated). I examine concurrent hypotheses below. Wives being paid could also cover for other household characteristics like the wife having created the firm, having more say over household decisions, or being more skilled. This would mean that the effect on men's earnings is not driven by women's status, but is instead caused by an omitted variable, causing both women to be paid and reallocation strategies to be less successful. However, decomposing the effects by firm creation (having longer tenure at the firm than the husband), age and education relative to the husband, does not explain the results and does not nullify the effect of having a paid co-working spouse on men's hourly earnings.

Another explanation could be that husbands with unpaid collaborators are hiding part of the firm profits from them. I model dissimulating income as lying to one's spouse about the parameters of the production function (e.g., TFP). Statically, spouses who are being lied to should provide less labor than spouses who know the real parameters, and dynamically, because they provide less labor, they should decrease labor supply less than paid spouses. However, the results show that unpaid spouses decreased their labor more than paid spouses, contradicting this hypothesis.

8 Conclusion

Although self-employed workers constitute the largest workforce in developing countries, little is known about the incidence of trade and industrial policy on these populations. Using an exogenous trade-driven decrease in self-employed workers' productivity and detailed data linking business structure, success, and time use for each spouse, I show that the availability of outside wage employment option for the worker, but also for their spouse, dictates responses to policy and shapes structural transformation. In contexts where self-employment is often a survival strategy in rationed labor markets, decreases in hourly wages can translate into increased labor input in declining occupations. In contrast, wage and hour rigidity often mutes these responses in salaried settings. Additionally, self-employed workers directly benefit from spousal unpaid domestic and productive work. Productivity-enhancing domestic work by spouses with a lower opportunity cost of time—usually women with limited outside options—acts as insurance against shocks, slowing down transitions out of affected jobs and keeping both men and women in non-wage working arrangements.

These results highlight the need to consider female (paid) labor market participation and men's access to wage employment not separately, but as an interconnected system that benefits from specific shock adaptation margins, making it particularly challenging to eliminate through policy.

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A Resolution of no-wage model

$$
\begin{aligned}
&L(c,h,\iota,\mu) = c^{\theta_c}(\bar{T}-h)^{\theta_l} + \mu(c - Ah^{\alpha}\iota^{\beta} + g\iota) \\
&\frac{\delta L}{\delta c} = U_c + \mu \Rightarrow U_c = -\mu \\
&\frac{\delta L}{\delta \iota} = \mu(A\alpha h^{\alpha}\iota^{\beta-1} - g) = 0 \Rightarrow g = A\beta h^{\alpha}\iota^{\beta-1} \\
&\frac{\delta L}{\delta \mu} \Rightarrow c = Ah^{\alpha}\iota^{\beta} - g\iota \\
&(7) \Rightarrow \iota = [\frac{g}{A\alpha h^{\alpha}}]^{\frac{1}{\beta-1}} \qquad (8) \\
&\frac{(6)}{(5)} = \frac{U_l}{U_c} = \frac{\theta_l c}{\theta_c(\bar{T}-h)} = A\alpha h^{\alpha-1}\iota^{\beta} \Rightarrow c = A\alpha h^{\alpha-1}\iota^{\beta}\frac{(\bar{T}-h)\theta_c}{\theta_l} = (8)Ah^{\alpha}\iota^{\beta} - g\iota \\
&\Leftrightarrow Q\frac{(T-h)\theta_c\alpha}{\theta_l h} = Q(1-\beta)(\text{using (7)}) \Leftrightarrow \frac{(\bar{T}-h)\theta_c\alpha}{\theta_l h} = 1-\beta \Leftrightarrow h(1-\beta) = (\bar{T}-h)\Theta\alpha \\
&\Leftrightarrow h(1-\beta+\Theta\alpha) = \bar{T}\Theta\alpha \Leftrightarrow h = \frac{\bar{T}\Theta\alpha}{1-\beta+\Theta\alpha}
\end{aligned}
$$

B robustness outside option

B.1 Alternative explanatory channels

	Earnings, job-level	*Hours, job-level*	*Income across all jobs*
Post × IndRetail × Expo	0.035	-0.273	-0.000
	(0.07)	(1.56)	(0.03)
Post × IndRetail × F × Expo	-0.201***	0.032	-0.113**
	(0.05)	(1.89)	(0.05)
Post × IndRetail × Has diploma × Expo	-0.082	-2.686	-0.023
	(0.10)	(1.71)	(0.08)
Post × IndRetail × F × Has diploma × Expo	0.116	5.626**	0.063
	(0.13)	(2.36)	(0.09)
R-squared	0.39	0.23	0.39
N	23638	53429	29980
District-Time FE	✓	✓	✓
Trimester FE	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 14: Heterogeneity analysis on sex and education

	Earnings, job-level	*Hours, job-level*	*Income across all jobs*
Post × IndRetail × Expo	-0.025	-2.160**	-0.060**
	(0.04)	(0.96)	(0.03)
Post × IndRetail × F × Expo	-0.148***	3.026***	-0.034
	(0.03)	(1.08)	(0.05)
Post × IndRetail × Sole breadwinner × Expo	0.072	1.854	0.169*
	(0.12)	(1.75)	(0.10)
Post × IndRetail × F × Sole breadwinner × Expo	0.035	0.818	-0.128
	(0.15)	(2.18)	(0.15)
R-squared	0.48	0.23	0.35
N	23638	53429	29980
District-Time FE	✓	✓	✓
Trimester FE	✓	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 15: Heterogeneity on being the sole breadwinner and sex

	daily earnings	hourly earnings
Post × IndRetail × ZDE	-0.172*	-0.253*
	(0.09)	(0.12)
Post × IndRetail × F × ZDE	-0.012	0.124
	(0.06)	(0.10)
Post × IndRetail × in_couple=1 × ZDE	0.194**	0.315***
	(0.08)	(0.10)
Post × IndRetail × F × in_couple=1 × ZDE	-0.291***	-0.466***
	(0.10)	(0.11)
Post × IndRetail × diploma=1 × ZDE	0.036	0.195
	(0.10)	(0.13)
Post × IndRetail × F × diploma=1 × ZDE	-0.024	-0.260**
	(0.10)	(0.12)
Post × IndRetail × in_couple=1 × diploma=1 × ZDE	-0.154	-0.254**
	(0.12)	(0.10)
Post × IndRetail × F × in_couple=1 × diploma=1 × ZDE	0.304**	0.474***
	(0.14)	(0.14)
R-squared	0.32	0.31
N	57541	32225
District-Time FE	✓	✓
Trimester FE	✓	✓

* p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndRetail =retail × self-emp. × start date < 06/2016. SE clustered at the district × retail level.

Table 16: Horserace between skill proxy and couple

C robustness intra-household

C.1 Testing for selection into marriage explaining differential shock exposure

C.2 Checking that results still hold in the married business owners subsample

	Earnings, job-level	*Hours, job-level*	*Income., all jobs*	*Log inc., all jobs*
2016-17 × Indiv in IndRetail × exp	-0.056	-1.959**	0.028	0.072
	(0.04)	(0.79)	(0.05)	(0.04)
2016-17 × Women × Indiv in IndRetail × exp	-0.151***	2.090**	-0.151	-0.161*
	(0.04)	(0.83)	(0.12)	(0.09)
R-squared	0.32	0.27	0.32	0.27
N	11204	11494	5642	5639
District-Time FE	✓	✓	✓	✓
Trimester FE	✓	✓	✓	✓

p<0.10, ** p<0.05, *** p<0.01 Expo: Z-score district exposure to caguwa at t-1. post: 2016-2017 round. F: female. IndTr/SpouseTr = indiv./spouse in retail × self-emp. × start date < 06/2016. SE clustered at the district*indiv/spouse treat level

Table 17: Average and gendered effect on subsample of married business owners