INSTITUTE OF DEVELOPING ECONOMIES

IDE Discussion Papers are preliminary materials circulated
to stimulate discussions and critical comments

IDE DISCUSSION PAPER No. 939

Origin of Goods and Unequal Consumer Gains from Trade Liberalization

Mi Dai* and Kiyoyasu Tanaka**

May, 2024

Abstract

We introduce the origin of goods in an otherwise standard framework to study the impact of tariff reductions on household cost-of-living. Our framework distinguishes three origins: import, domestic production, and household production. We adopt this framework to estimate the unequal consumer gains from tariff reductions in Cambodia, using a unique household survey data with detailed expenditure records on goods and services from each origin. We find that richer households have larger expenditure shares on imported goods and smaller expenditure shares on home-produced goods. Price responses to tariff changes are strongest for imported goods and weak for home-produced goods. As a result, tariff reductions generate a strong pro-rich effect, with households at the 80-90 income percentile gaining 40% more than those at the 0-10 percentile. We show that ignoring origins in the cost-of-living measurement can substantially underestimate the pro-rich effects of trade liberalization. We also analyze why richer households have larger expenditure shares on imported goods and provide evidence consistent with trade models with non-homothetic preferences.

Keywords: Trade liberalization, Inequality, Origin of goods, Welfare, Cambodia
JEL classification: F14, F15, D30, D60, E21

---

* Business School, Beijing Normal University
** (Corresponding author): Institute of Developing Economies, JETRO

The Institute of Developing Economies (IDE) is a semigovernmental, nonpartisan, nonprofit research institute, founded in 1958. The Institute merged with the Japan External Trade Organization (JETRO) on July 1, 1998. The Institute conducts basic and comprehensive studies on economic and related affairs in all developing countries and regions, including Asia, the Middle East, Africa, Latin America, Oceania, and Eastern Europe.

INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

Origin of Goods and Unequal Consumer Gains from Trade Liberalization[*]

Mi Dai
Beijing Normal University

Kiyoyasu Tanaka
IDE-JETRO

May, 13, 2024

Abstract

We introduce the origin of goods in an otherwise standard framework to study the impact of tariff reductions on household cost-of-living. Our framework distinguishes three origins: import, domestic production, and household production. We adopt this framework to estimate the unequal consumer gains from tariff reductions in Cambodia, using a unique household survey data with detailed expenditure records on goods and services from each origin. We find that richer households have larger expenditure shares on imported goods and smaller expenditure shares on home-produced goods. Price responses to tariff changes are strongest for imported goods and weak for home-produced goods. As a result, tariff reductions generate a strong pro-rich effect, with households at the 80-90 income percentile gaining 40% more than those at the 0-10 percentile. We show that ignoring origins in the cost-of-living measurement can substantially underestimate the pro-rich effects of trade liberalization. We also analyze why richer households have larger expenditure shares on imported goods, and provide evidence consistent with trade models with non-homothetic preferences.

Keywords: Trade liberalization, Inequality, Origin of goods, Welfare, Cambodia
JEL Classification: F14, F15, D30, D60, E21

[*]Dai: Business School, Beijing Normal University; address: No. 19 Xinjiekou Outer Street, Beijing 100875, China; e-mail: daimi002@bnu.edu.cn; Tanaka (corresponding author): Institute of Developing Economies, JETRO; address: 3-2-2 Wakaba, Mihama-ku, Chiba-shi, Chiba 261-8545, Japan; e-mail: kiyoyasu_tanaka@ide.go.jp. We thank Kazunobu Hayakawa, Shujiro Urata, Ian Coxhead, Thao Trang Nguyen, Hanwei Huang, and seminar participants at 2024 Empirical Investigations in Trade and Investment, 2023 Summer Workshop on Economic Theory, 2023 EAEA conference, Hitotsubashi University, Hiroshima University, IDE-JETRO, and Aoyama Gakuin University for useful comments and suggestions. We acknowledge the financial support of JSPS Grant-in-Aid for Young Scientists (B) Grant Number 16K17129, Scientific Research (C) 21K01517 and Scientific Research (A) 18H03637, and National Science Foundations of China (No. 72373012). Declarations of interest: none. All remaining errors are our own.

1 Introduction

Trade creates both winners and losers within a country. From consumers' perspective, the liberalization of import tariffs can produce heterogeneous gains between rich and poor households for their different expenditure patterns. A critical aspect of expenditure is the origin of goods — whether they are imported from abroad, produced in a domestic market, or produced at home for self-sufficiency. As tariffs can affect the prices of goods differently across origins, consumer gains depend crucially on the consumption basket of goods with different origins. While an extensive body of literature, dating back to Porto (2006), has estimated the distributional effects of trade liberalization with household expenditure data, limited studies explicitly distinguish the origin of goods in consumption.[1] Thus, the crucial question remains of how the origin of goods affects the welfare and distributional effects of trade.

This paper addresses this question theoretically and empirically. We develop a simple theoretical framework to study consumer gains from tariff changes. Based on the standard framework to measure the first-order impact on household welfare (Deaton, 1989; Porto, 2006), we explicitly distinguish among imported, domestic, and home-produced goods in household expenditures and allow for different tariff pass-through rates across these origins. The model yields a parsimonious expression of consumer gains from tariff changes, which can be measured by three sets of variables: (i) tariff pass-through rates for imported and domestic goods; (ii) household-specific expenditure shares on imported, domestic, and home-produced goods; and (iii) household-specific tariff changes for imported and domestic goods. Thus, expenditure heterogeneity across both goods and origins can play a crucial role in the distributional effects of tariff reduction.

We draw on this theoretical framework to assess the welfare and distributional impacts of import tariff liberalization in a low-income country, Cambodia. We use the Cambodian household surveys during 2004 and 2019 after the country's accession to the World Trade Organization (WTO) in 2004. The survey is unique in that it reports household consumption with the value and quantity for imported, domestic, and home-produced goods and services at the finely disaggregated level. For example, we observe the value and quantity of household consumption on imported, domestic, and home-produced vegetables separately. This feature allows us to compute the expenditure share on goods from different origins for each household and to estimate different tariff pass-through rates across origins. Since prior work has not exploited such detailed expenditure data, we shed new light on consumer gains from trade liberalization.

We proceed with the empirical analysis in three steps. First, we describe the expenditure share by origin along the income distribution. We highlight the expenditure share on imported goods, which we label "import shares" following Borusyak and Jaravel (2021). We find that import shares

[1] Nicita (2009) points out that household surveys typically do not indicate whether goods are imported or domestically produced.

increase strongly with household income: households at the 0-10 income percentile spend 7% of their expenditures on imported goods, whereas those at the 90-100 percentile spend 38%. In addition, the expenditure share on home-produced goods declines strongly with household income. Given that tariff reductions should have the strongest impact on the prices of imported goods and little impact on home-produced goods, these expenditure patterns contribute to pro-rich consumer gains.

Second, we construct a comprehensive dataset on retail prices and tariffs across 351 goods during the period 2004-2019 to estimate tariff pass-through rates separately for each origin. For identification, we exploit the variation of price changes across goods, origins, and years. The results show tariff pass-through rates of 62.7% for imported goods and 32.3% for domestic goods. Meanwhile, tariff changes have little impact on the prices of home-produced goods.

Third, we use data on expenditure shares, actual tariff changes, and estimated tariff pass-through rates to compute consumer gains from tariff reductions for each household. We find that tariff reductions are strongly pro-rich. For example, households at the 80-90 income percentile gain 40% more than those at the 0-10 percentile. These pro-rich effects are robust when allowing for expenditure switching across goods and origins under a non-homothetic CES demand system as in Auer et al. (2024). In addition, we examine how the distinction of origins affects the estimated distributional effects. Specifically, we calculate alternative measures of consumer gains under different assumptions in terms of available information on origins: (i) origin is totally unknown; (ii) home-produced goods are distinguished from other origins, but imported goods are not distinguished from domestic goods, and (iii) all origins are distinguished. Comparing consumer gains under alternative assumptions, we find that a finer distinction of origins tends to magnify the pro-rich effects of trade liberalization. If the origin of goods is totally unknown, estimated consumer gains are almost neutral. Distinguishing home-produced from other goods is crucial to generate a pro-rich effect, whereas a further distinction between imported and domestic goods magnifies the pro-rich effects. Intuitively, aggregating across origins masks the larger import shares and smaller home-produced shares for the rich, thereby reducing their estimated consumer gains relative to the poor.

A key driver of pro-rich consumer gains is the positive relationship between import shares and income. To examine why rich and poor households have different import shares, we decompose the expenditure differences across income groups along three dimensions: between sectors, between goods within a sector, and within a given good. We show that expenditure differences in all three dimensions lead to higher import shares for the rich. In terms of between-sector expenditures, richer households spend less on low-import-intensity agricultural goods and more on high-import-intensity manufactured goods.[2] In terms of between-goods expenditures, richer

[2]Richer households also have larger expenditure shares on services, which tends to reduce the import shares for the rich.

households have larger expenditure shares on goods with higher import intensity within the agricultural and manufactured sectors. In terms of within-goods expenditures, richer households consume a larger proportion of imported varieties. A decomposition of import shares shows that the between-sector, between-goods, and within-goods effects explain 54%, 40%, and 6% of the expenditure differences in import shares between the richest and poorest income decile, respectively.

We argue that these results are consistent with the recent theories of international trade with non-homothetic preferences in the context of low-income countries. First, as households become richer, they shift their expenditure toward more income-elastic goods, such as cars or cellphones. In low-income countries, these income-elastic goods are typically imported from developed countries for comparative advantage reasons in technology or skill-intensity (Fieler, 2011; Caron et al., 2014). This pattern is consistent with the positive "between-goods effect" observed in our data. Second, richer households consume more high-quality varieties within each goods, which are also imported from developed countries (Hummels and Klenow, 2005; Schott, 2004; Khandelwal, 2010; Fajgelbaum et al., 2011; Hallak and Schott, 2011; Heins, 2023). This pattern is consistent with the positive "within-goods effect". In sum, the positive relationship between import shares and income is a natural consequence from non-homothetic preferences and the patterns of international specialization between high and low-income countries. As our findings extend to other low-income countries for theoretical reasons, disaggregating origins in household expenditures may produce pro-rich consumer gains in other developing countries.

There is a large literature on the distributional effects of trade in developing countries. A number of studies have examined the cost-of-living effects, including Porto (2006) for Argentina, Nicita (2009) for Mexico, Ural Marchand (2012) for India, Nicita et al. (2014) for Sub-Saharan Africa, Han et al. (2016) for China, and Artuc et al. (2019, 2021) for 54 developing economies. These studies have reached mixed conclusions regarding the effects of tariff reductions on cost-of-living inequality, with a pro-poor effect found in some countries but a pro-rich effect in others. A common limitation of these studies is that they cannot distinguish origins in household expenditures. As a result, the distributional effects are driven by the expenditure pattern across goods and sectors, but not across origins. We contribute to this literature by introducing expenditure heterogeneity across origins into the framework of the prior studies. We show that incorporating this additional dimension is vital. In fact, the pro-rich effect in our study is almost entirely driven by the expenditure pattern across origins, whereas the expenditure pattern across goods and sectors suggests a neutral or slightly pro-poor distributional effect. Our analysis also suggests that the true pro-rich effects of trade liberalization in developing countries may have been larger than what the existing studies have shown.

Our paper is also related to an expanding literature on the heterogenous consumer gains from trade (Fajgelbaum et al., 2011; Fajgelbaum and Khandelwal, 2016; Faber and Fally, 2022; Atkin et al., 2018; Heins, 2023; Borusyak and Jaravel, 2021; Auer et al., 2024; Carroll and Hur, 2020; and

Hottman and Monarch, 2020). Most closely related to our study is a recent strand of literature that emphasizes household's heterogeneous exposure to imports. Borusyak and Jaravel (2021) argue that household expenditure shares on imported goods can serve as a sufficient statistic to measure consumer gains from trade under certain conditions. Measuring import shares in the U.S., they find little correlation between import shares and income, suggesting a neutral distributional effect from a uniform tariff reduction across goods. Auer et al. (2024) construct household import shares in Switzerland and show that import shares tend to increase with income. Breinlich et al. (2022) measure import shares for the U.K. and investigate the distributional consequences of exchange rate changes.

We make several contributions to this literature. First, to our knowledge, this paper is the first to document household heterogeneity in import shares in a developing country. Evidence from a developing country is valuable because recent trade theories with non-homothetic preferences imply that the relationship between import share and household income can differ between developed and developing countries (Caron et al., 2014; Fajgelbaum et al., 2011). As such, our results complement the studies on developed countries. Second, the aforementioned studies collect information on imported and domestic goods only for a limited range of goods such as cars or packaged consumer goods. For most goods and services, input-output tables are used to measure import shares by assuming that households consume an identical proportion of import varieties within each goods. In contrast, we observe the expenditure by origin for all goods and services. This allows us to measure import share precisely without imposing any proportionality assumptions. Finally, as in Borusyak and Jaravel (2021), we examine the sources of import share heterogeneity across households by decomposing import shares into between-sector, between-goods, and within-goods components, and evaluating their relative contributions. This exercise provides micro-level empirical support for the recent trade models with non-homothetic preferences.

The rest of the paper is organized as follows. Section 2 describes a theoretical framework to evaluate household welfare. Section 3 describes expenditure shares by the origin of goods and data sources of household expenditures and import tariffs. Section 4 estimates tariff pass-through rates for goods by origin. Section 5 evaluates consumer gains and the distributional consequences of tariff reduction and discusses the role of origins in welfare evaluation. Section 6 examines the relationship between import shares and household income. Section 7 concludes.

2 Theoretical Framework

This section develops a theoretical framework to study the impact of tariff changes on household welfare through the expenditure channel. We derive welfare effects using first-order approximation, following a standard approach in the literature (Deaton, 1989; Porto, 2006; Nicita, 2009;

Ural Marchand, 2012; Artuc et al., 2019; Borusyak and Jaravel, 2021).[3] We highlight that the origin of goods can play a key role in welfare effects through household expenditure patterns and price transmission from trade liberalization. The model yields a parsimonious expression of welfare changes, which can be measured with empirical data.

We consider an economy with G goods and K origins. In each good g, there are varieties from different origins k. Household's preferences over goods and origins are represented by the indirect utility function $v_h(y_h, \boldsymbol{p})$, which indicates the maximum utility that household h with income y_h can obtain at prices $p = \{p_g^k\}$. The associated demand functions are $x_{hg}^k(y_h, \boldsymbol{p})$, and the expenditure shares are denoted by $s_{hg}^k(y_h, \boldsymbol{p}) = (p_g^k x_{hg}^k)/y_h$.[4]

Consider the change in the log of indirect utility, $\hat{v}_h$, due to an infinitesimal change in log prices ($\hat{p}_g^k$) and in log household income ($\hat{y}_h$):[5]

$$\hat{v}_h(y_h, \boldsymbol{p}) = \frac{\partial ln v_h}{\partial ln y_h}\hat{y}_h + \sum_{g,k} \frac{\partial ln v_h}{\partial ln p_{gk}} \hat{p}_g^k. \tag{1}$$

We define the compensating variation of a household, $\hat{W}_h$, as the log change in income that leads to the indirect utility change $\hat{v}_h$ at constant prices:

$$\hat{v}_h(y_h, \boldsymbol{p}) = \frac{\partial ln v_h}{\partial ln y_h}\hat{W}_h. \tag{2}$$

Combining equations (1) and (2) and applying Roy's identity lead to the expression for household welfare changes:

$$\hat{W}_h = \hat{y}_h - \sum_{g,k} s_{hg}^k \hat{p}_g^k. \tag{3}$$

As is well-known, a trade policy can affect household welfare through two effects: income effect and cost-of-living effect. In this paper we focus on the cost-of-living effect, which is captured by the second term on the right-hand side of equation (3): $-\sum_{g,k} s_{hg}^k \hat{p}_g^k$. The changes in cost-of-living are measured by the weighted average of price changes in all goods-origin pairs consumed by household h, with a weight of household expenditure shares across goods and origins. To focus on the cost-of-living effect, we assume that the income effect is zero ($\hat{y}_h = 0$) throughout the paper. Thereafter, we label $\hat{W}_h$ as cost-of-living effect or consumer gain.

To match with the distinction of origins in our data, we explicitly distinguish three origins: im-

[3]Another strand of related literature examines consumer welfare gains from trade in a structural framework and estimates the exact consumer gains from trade (Fajgelbaum and Khandelwal, 2016; Nigai, 2016; Auer et al., 2024). In section 5.3, we evaluate consumer gains under a non-homothetic CES demand system as in Auer et al. (2024). Although data limitations constrain us from estimating the key parameters of the model with our data, our main findings do not change qualitatively under a wide range of calibrated parameter values.

[4]Throughout the paper we assume total expenditure is equal to income. This assumes away household savings.

[5]We use "hat" to denote log changes. i.e. $\hat{x} = dlnx$

ported (M), domestic (D), and home-produced (H). With this distinction, the cost-of-living effect in equation (3) can be re-written as

$$\hat{W}_h = -(\sum_g s^M_{hg}\hat{p}^M_g + \sum_g s^D_{hg}\hat{p}^D_g + \sum_g s^H_{hg}\hat{p}^H_g). \tag{4}$$

To introduce tariffs into the framework, we extend the literature by allowing for differential tariff pass-through rates for imported, domestic, and home-produced goods. Specifically, we assume that tariff pass-through rates differ between imported and domestic goods, but are common across goods given import status:

$$\hat{p}^M_g = \eta^M \hat{\tau}_g, \tag{5}$$

$$\hat{p}^D_g = \eta^D \hat{\tau}_g, \tag{6}$$

where η^M and η^D are tariff pass-through rates for imported and domestic goods, respectively. $\hat{\tau}_g = dlog(1+\tau_g)$ is the log change in gross import tariff rate on goods g. From a theoretical perspective, tariff changes can affect the price of imported goods directly through changes in marginal costs and indirectly through changes in markups. When tariff changes are completely translated into the retail price, we have a complete pass-through, $\eta^M = 1$. Meanwhile, the literature typically suggests an incomplete pass-through rate, $\eta^M < 1$. This incomplete pass-through on the retail prices can arise because of local distribution costs (Corsetti and Dedola, 2005) and strategic interactions in firm's pricing behavior (Atkeson and Burstein, 2008; Amiti et al., 2019). For η^D, tariff changes can indirectly affect the price of domestic goods through strategic interaction mechanisms. Although we do not impose any restrictions on the relative magnitude of η^M and η^D, we predict a higher pass-through rate for imported goods, $\eta^M > \eta^D$ because imported goods are more directly exposed to tariff changes than domestic goods. In addition, we assume that tariff changes have no impact on the price of home-produced goods:

$$\hat{p}^H_g = \eta^H \hat{\tau}_g \quad with \quad \eta^H = 0, \tag{7}$$

where η^H is the tariff pass-through rate for home-produced goods. This assumption captures the idea that the subsistence portion of expenditure for households is unaffected by a trade policy (Ural Marchand, 2012; Artuc et al., 2019). We provide evidence for these assumptions in Section 4. Substituting equations (5) – (7) into equation (4) yields:

$$\hat{W}_h = -(\eta^M \sum_g s^M_{hg}\hat{\tau}_g + \eta^D \sum_g s^D_{hg}\hat{\tau}_g), \tag{8}$$

where the cost-of-living change is expressed as a function of tariff changes, expenditure shares, and pass-through rates for imported and domestic goods. Home-produced goods do not contribute to the cost-of-living changes because of the assumption of a zero pass-through rate, $\eta^H = 0$. Based on equation (8), we calculate consumer gains from expenditure shares on imported and domestic goods g for household h, tariff pass-through rates for imported and domestic goods, and goods-specific tariff changes. The following analysis aims to construct these datasets for Cambodian households.

To understand welfare changes across households, it is intuitive to express the cost-of-living change as a function of household-level variables. Thus, we re-write equation (8):

$$\hat{W}_h = -[\eta^M IMPSH_h(\sum_g \tilde{s}^M_{hg}\hat{\tau}_g) + \eta^D DOMSH_h(\sum_g \tilde{s}^D_{hg}\hat{\tau}_g)], \tag{9}$$

where $IMPSH_h$ and $DOMSH_h$ are the share of expenditure on imported and domestic goods in total expenditure for household h, respectively.[6] We label $IMPSH_h$ and $DOMSH_h$ as the "import share" and "domestic share". $\tilde{s}^M_{hg}$ and $\tilde{s}^D_{hg}$ are the share of expenditure on goods g within the total expenditure on imported and domestic goods for household h, respectively. Equation (9) highlights that three variables determine the magnitude of cost-of-living changes: tariff pass-through rates for imported and domestic goods, household-specific expenditure shares on imported and domestic goods, and household-specific tariff changes for imported and domestic goods.[7] Intuitively, if a decline in tariff rates reduces the price of imported goods more than that of domestic goods, consumer gains are greater for households that consume imported goods in a larger proportion. If tariff changes do not affect the price of home-produced goods, consumer gains are smaller for households that consume home-produced goods in a larger proportion.[8] Furthermore, if tariff reductions are larger for some goods, consumer gains are larger for households that consume these goods in a larger proportion.

Finally, there are caveats about our framework. First, this framework captures the first-order impact of trade liberalization but does not consider the consumer gains induced by expenditure switching across goods and origins. We adopt the first-order approach because Cambodian household surveys are repeated cross-sectional data and we cannot observe the expenditure switching patterns in our data. Nevertheless, we take an exact approach in Section 5.3 and examine the distributional effects in a non-homothetic CES demand system as in Auer et al. (2024), assuming a wide range of substutability across goods and origins. We find that the main conclusions obtained from the first-order approach are robust. Second, we have not explicitly distinguished tradable and non-tradable sectors in equation (8), and a "goods" g can refer to both goods and services. In the empirical analysis, there are only tariff data on the traded sector, i.e. agricultural and manufac-

[6] Detailed derivations of equation (9) are described in Appendix A1.

[7] Under further assumptions that (i) tariff reductions are identical across goods, and (ii) the prices of domestic goods do not respond to tariff changes ($\eta^D = 0$), equation (9) suggests that household import share serves as a sufficient statistic to measure consumer gains from tariff changes, as in Borusyak and Jaravel (2021). See Appendix A2 for discussions.

[8] Note that $IMPSH_h + DOMSH_h \neq 1$ if the household also consumes home-produced goods. The home-produced share does not enter equation (9) because of the assumption that tariffs do not affect the prices of home-produced goods.

turing, and we assume tariff changes do not directly affect the price of services in the non-traded sector. In this case, consumer gains increase with household expenditure share on goods in the traded sector.[9] This mechanism produces a pro-poor effect because poorer households tend to spend a larger fraction of expenditure on traded goods (Fajgelbaum and Khandelwal, 2016; Carroll and Hur, 2020). Admittedly, the price in the non-traded sector can be affected by tariff changes in a general equilibrium framework (Kovak, 2013; Porto, 2006; Han et al., 2016). However, these effects are indirect and difficult to precisely quantify with the available data for our study. Note that if tariff reductions further drive down the price of services, the pro-rich effects found in our subsequent analysis will be even stronger, because richer households have larger expenditure shares on services. Third, we do not consider household's expenditure on imported intermediate inputs embedded in domestic and home-produced goods. Measuring this indirect import exposure requires an input-output table with disaggregated industry classifications and distinction between expenditures on imported and domestic goods. Unfortunately, such data are not available for Cambodia. With these caveats in mind, we move on to the empirical investigation.

3 Data Description

3.1 Household Expenditures

Expenditure shares on goods from different origins play a key role in determining consumer gains from tariff reductions. As we can directly observe household expenditures on goods and services across origins, we start by describing expenditure patterns for Cambodian households.

Cambodian Social-Economic Surveys. Our main dataset comes from the Cambodian Socio-Economic Surveys (CSES). The survey was conducted intermittently from 1993 to 2004 and annually from 2007. For the analysis, we use surveys with a large sample size in 2004, 2009, 2014, and 2019/20; a nationwide representative sample of around 12,000 households for each round. The survey includes questions on households and their household members to collect information about their living conditions such as housing, income, and consumption.

We exploit household diary records of their expenditure transactions and consumption of home-produced goods during two executed weeks within a survey month. In the diary, households provide information on individual transactions, including dates (month and day), goods (services), quantity, unit of quantity, value in riels, and form of acquisition.[10] Based on face-to-face interviews, enumerators fill out questions on the origin of goods and purpose in each transaction. The origin of goods is classified as (1) household production, (2) produced in Cambodia, (3) imported from abroad, (4) unknown, and (5) no product.[11] This question allows us to measure

[9] We formalize this argument in Appendix A3.

[10] The form of acquisition is classified into (1) paid in cash, (2) paid in kind, (3) purchased on credit, (4) gift received, and (5) stock of own-produced.

[11] The purpose is classified into (1) own household consumption, (2) agricultural production, (3) manufacturing

household expenditures on goods from each origin.

The survey classifies transactions on goods and services into 606 items for 2004 and 489 for 2009, 2014, and 2019/20. As the item classification is more detailed in 2004, we concord on items between 2004 and post-2009 surveys. We manually assign a sector to these items in the post-2009 surveys. The item classification shows 203 agricultural goods, 170 manufactured goods, and 108 services. We made substantial efforts to clean the diary data by excluding transactions with coding errors in the unit of quantity and outliers in unit values. We replace the expenditure in the diary on rents, cars, and motorcycles with corresponding expenditures in recall questions: while these items can explain a large share of household expenditures, they are rarely recorded in the two-weeks diary.[12] In the raw dataset, the total number of expenditure transactions is around 2.5 million in 2004, 2.6 million in 2009, 1.38 million in 2014, and 0.55 million in 2019/20. In the cleaned one, it is around 2.1 million in 2004, 2.3 million in 2009, 1.1 million in 2014, and 0.47 million in 2019/20 (Table A1).

We also use the CSES to measure permanent income for households. In low-income countries, it is generally difficult to precisely measure household income (Glewwe et al., 2004). Households typically engage in small businesses and agriculture, but their net income can contain substantial errors for seasonal fluctuations in agricultural sales and inaccurate measurement of business revenues and costs. To mitigate measurement issues in income, we use household expenditures as a proxy for permanent income. Specifically, monthly household expenditures are measured by aggregating expenditures on food, non-food, and housing in the recall questions on household consumption.[13] We calculate expenditure per capita by dividing total expenditure with adult-equivalent adjusted household size.[14]

Expenditure Shares by Origin. Table 1 reports expenditure shares by origin of goods for each income decile in 2004, the initial year of our sample. On average, households spend 16% of their total expenditure on imported goods, 62% on domestic goods, and 22% on home-produced goods. The average number, however, masks substantial heterogeneity across income groups. Two key patterns are evident in Table 1. First, household's import shares increase strongly with income. While households at the 0-10 percentile spend 7% of their expenditures on imported goods, those at the 90-100 percentiles spend 38%. This finding implies that if tariff reduction mainly reduces the price of imported goods, consumer gains are larger for the rich than for the poor. Second, the

production, (4) mining production, (5) services production, (6) other household production, (7) gifts and remittances to other households, (8) offerings, donations, and charities, (9) interests, (10) payback of loans, (11) taxes, and (12) other.

[12]See Appendix B for details of data construction.

[13]Housing includes household expenses on utilities (water, sewage, wastewater disposal, garbage collection), fuel for lighting and cooking (electricity, gas, kerosene, firewood, charcoal, and batteries), and paid rent. We use the self-evaluated rent of a similar house for owner-occupied houses. Meanwhile, the 2004 survey does not ask a question on self-evaluated rents; thus, rent for owner-occupied houses is estimated via a hedonic method, as described in Appendix C.

[14]Adult-equivalent adjusted household size is calculated by (1 + 0.7×(A-1) + 0.5×K), where A is the number of adults (over 15 years old) and K is the number of children in a corresponding household.

expenditure share on home-produced goods declines strongly with income: 32% for households at the 0-10 percentile and only 4% for those at the 90-100 percentile. This finding also suggests a pro-rich effect of tariff reduction, as the price of home-produced goods is insensitive to tariff changes.

---Table 1 here---

The strong positive relationship between import share and household income in Cambodia provides an interesting comparison with Borusyak and Jaravel (2021), who find little correlation between import share and household income in the U.S. This comparison illustrates how the exposure to imports across households may differ between low-income and high-income economies due to differences in a country's comparative advantage. Specifically, richer households tend to purchase more income-elastic goods and higher-quality varieties within a goods category. For a low-income country like Cambodia, these goods and varieties are typically imported because they are inconsistent with the country's comparative advantage. We examine this point in Section 6.

3.2 Import Tariffs

We examine import tariff liberalization in Cambodia after the country's accession to the WTO in 2004. To compute import tariff rates, we construct a dataset on applied tariff rates in Cambodia at the HS 6-digit level for all partner countries across years. These tariff rates are based on most-favor-nation (MFN) and preferential tariff rates (WTO, 2017).[15] Import tariff rates are measured by the applied MFN tariff rates for partner countries that did not conclude any free trade agreements (FTAs) with Cambodia because Cambodia provides MFN treatment to non-WTO members. Meanwhile, the tariffs are the lowest of the MFN or preferential tariff rates for partners with FTAs during our sample period: ASEAN, Australia, New Zealand, China, India, Japan, and Korea. We construct data on preferential tariffs from original documents on FTAs, because missing data are serious in publicly available tariff data such as the World Bank's World Integrated Trade Solution (Teti, 2020).

We calculate the applied tariff rates for each country-year observation at the HS 4-digit level in the HS 2007 nomenclature. Using the HS 6-digit tariff data, we compute a simple average of applied tariff rates in HS 4-digit codes for MFN and FTA regimes. We compute the import-weighted tariff rates at the HS 4-digit level for goods g, partner country c, and year t:

$$\tau_{gt} = \sum_{c} \bar{s}_{gc} Tariff_{cgt}, \tag{10}$$

where $Tariff_{cgt}$ is the lowest of the applied MFN or preferential tariffs for each goods-country-year observation.[16] $\bar{s}_{gc}$ is an import weight for each goods-country observation as measured by

[15] See Appendix D for more details on our data sources and construction.

[16] We assume that importers use the lowest of the MFN rate or preferential tariff rates for their imports in Cambodia. In practice, rules of origin can induce some importers to pay higher tariffs, leading to the under-utilization of

the period-average imports in Cambodia for goods g and country c; i.e., $\bar{s}_{gc} = \frac{\sum_t Import_{gct}}{\sum_c \sum_t Import_{gct}}$ for t=2004,…,2019. $Import_{gct}$ is the nominal value of Cambodia's imports in goods g from country c for year t. Data on imports come from the UN Comtrade. We use the import statistics reported by the Cambodian government. We construct import weights based on all years for the period 2004-2019 to mitigate the influence of substantial short-run changes in imports over time and to reduce the omission of tariff rates for zero imports.

To link goods in the expenditure and tariff data, we construct a concordance on items between the diary and tariff data at the 4-digit level in the HS 2007 nomenclature. We manually check each description and assign the HS 4-digit code by referring to the goods description in the HS 2007 nomenclature. For 489 items in the diary data, we assign 351 tariff codes. Unmatched expenditure items are mostly services such as repairs, house rent, insurance, and transportation. We use the first tariff code for items matched with multiple tariff codes. Ultimately, the number of unique tariff codes is 181 in the item classification.

Figure 1 shows that the weighted-average tariff rates decreased from 15.6% in 2004 to 3.3% in 2019, implying a 12.3 percentage-points decrease in the applied import tariffs.[17] Meanwhile, the weighted average of the MFN rates declined by 6.0 percentage points during this period. Thus, it is crucial to account for preferential tariffs in precisely measuring import tariffs for Cambodia.[18] For more details on tariff declines across goods, Table A3 provides the summary of tariff rates at the HS 4-digit level. The average tariff decline is larger for processed food and textile/apparel/footwear and smaller for mineral and chemical goods.

---Figure 1 here---

4 Estimating Tariff Pass-through Rates by Origin

This section estimates pass-through rates at which a change in import tariff rates is transmitted to the retail price of domestic and imported goods paid by consumers. We estimate the relationship between import tariffs and unit values of expenditures at the household-goods-origin level by using all the survey datasets for 2004, 2009, 2014, and 2019/20.[19] Specifically, we estimate the following equation for household h, goods g, origin k, and year t:

$$lnP_{hgkt} = \beta_1 ln(1+\tau_{gt}) + \beta_2 ln(1+\tau_{gt})IM_k + \gamma WP_{gt} + f_h + f_g + f_{jt} + f_{pkt} + e_{hgkt}, \quad (11)$$

preferential treatment. Applied tariff rates should be based on heterogeneous utilization rates across exporters and goods. However, there is no publicly available information on the actual utilization rates for Cambodia's imports.

[17] Based on raw tariff data, Figure A1 shows the averages of HS 6-digit tariff rates for the MFN and FTA regimes for the period 2002–2019. Preferential tariffs declined more significantly than MFN tariffs, suggesting that FTA partners experienced a larger decrease in Cambodia's tariffs.

[18] While prior work on Cambodia's trade, such as Erten and Keskin (2024), focuses only on MFN rates, our data show the increasing importance of preferential tariffs.

[19] Previous work also uses unit values as a proxy for the retail price of tradable goods (Nicita, 2009; Ural Marchand, 2012; Han et al., 2016). The unit values reflect a decision made by households over quality, quantity, and origin of goods. While we cannot explicitly isolate these choices, we mitigate these influences with a large number of fixed effects.

where P_{hgkt} is the unit value of goods g from origin k purchased by household h in year t; τ_{gt} is the ad-valorem tariff rate of goods g in year t; IM_k is a dummy variable that takes on unity if a good is imported, and zero otherwise. WP_{gt} is a proxy for the world price of goods g in year t.[20] f is a variety of fixed effects for households, goods, origin, and year. Finally, e_{hgkt} is an error term. We use household-level sampling weights in the estimation and report standard errors clustered by goods and province.[21]

The coefficients of interest are β_1 and β_2. In the baseline specification, our sample includes imported and domestic goods. Thus, β_1 represents the average tariff pass-through elasticity for domestic goods, i.e., the percentage increase in the retail price of domestic goods due to a 1% increase in the gross tariff rate. $\beta_1 + \beta_2$ shows the average tariff pass-through rate for imported goods, whereas β_2 shows the difference in the pass-through rates between domestic and imported goods. We use the estimated pass-through rates to predict the changes in the retail price of domestic and imported goods from tariff reductions.

The retail price of tradable goods is affected not only by the change in import tariffs, but also by unobserved factors across households and goods over time. To mitigate confounding factors, we include a wide range of fixed effects. First, f_h represents the household-level fixed effects to control for household characteristics such as income, family structure, preference, and location. Although we use repeated cross-sectional data at the household level, f_h is controlled for because we exploit variations on tariff rates across goods and year for identification. Second, f_g is the goods-unit fixed effects to account for price differences across goods and the different measurement of quantity for each goods, i.e., rice in kilograms or grams. Third, f_{jt} is the sector-year fixed effects to control for changes in producer prices over time resulting from industrial changes in technology, supply chains, and market competition. The sector j is defined at the 4-digit level in the international standard industrial classification revision 3 (ISIC3) using a concordance between the HS 2007 nomenclature and ISIC3. Finally, f_{pkt} denotes the province-origin-year fixed effects to account for the differential inflation rates of goods by province and origin over time.

Column (1) of Table 2 reports the regression results of equation (11), with the sample including domestic and imported goods. The coefficients of β_1 and β_2 are significant and positive, showing a tariff pass-through rate of 32.4% for domestic goods and 63.2% for imported goods. We test the hypothesis that the sum of β_1 and β_2 is zero and find that we cannot reject it at any significance level below 0.3%. Controling for log world prices has little effects on the results (column 2). For comparison, we also estimate a standard tariff pass-through equation that does not distinguish

[20] The world price is proxied by the log of the average unit values of total exports from the top 5 trading partners into Cambodia in 2004: China, Hong Kong, Taiwan, Thailand, and Vietnam.

[21] While previous work generally uses goods- and regional-level data, we use data at the household-goods level to control for unobserved household effects. Since our surveys include different households across years, the composition of households with different incomes should change over time. Since households at different income levels can purchase different varieties of a good, household composition changes make it difficult to accurately measure price changes of the same variety of goods using aggregate goods-level data.

origin of goods. This specification is similar to that in prior work such as Nicita (2009), Ural Marchand (2012), and Han et al. (2016). The results in columns (3) and (4) show that when domestic and imported goods are not distinguished, the estimated pass-through rate for the pooled sample is 35.4%, which lies between the pass-through rate for imported and domestic goods. Thus, pooling imported and domestic goods together may under-estimate the pass-through rate of imported goods, while over-estimate that for domestic goods.

In the theoretical section, we assume that the prices of home-produced goods are unaffected by tariffs. In the last two columns of Table 2, we estimate a simple tariff pass-through equation for the unit value of home-produced goods. The coefficient of the tariff variable is not significant. While we control for the world price in column (6), the coefficient remains insignificant. These results support the assumption that tariff changes have no impact on the price of home-produced goods.

---Table 2 here---

For robustness checks, we report the results of alternative specifications in Table A4. First, we address possible outliers in unit values by winsorizing the variable: unit values smaller than the 1 percentile are replaced by the 1 percentile, while unit values larger than the 99th percentile are calculated with the 99th percentile. Columns (1) and (2) show similar results after considering possible outliers in the unit values. Next, we disaggregate the sample over payment modes and consumption purposes and control for unobserved fixed effects in these variations of the data. This is because some expenditure transactions may not be based on a market and their unit values can largely deviate from the market price. Columns (3) and (4) show that the main results are unchanged after considering transaction-level payments and purposes. In addition, we focus only on transactions with cash payments and household-consumption purposes. In column (5), the coefficient for a single pass-through rate is not significant. In column (6), β_1 is not significant, but β_2 is significant and positive. As the sum of β_1 and β_2 is significant, a positive pass-through is confirmed for imported goods.

5 Quantifying Consumer Gains

This section computes consumer gains from tariff reductions and discusses the distributional consequences of trade liberalization. We calculate alternative measures of consumer gains at different disaggregation levels of the origin of goods and discuss possible bias in the distributional effects when origins are not distinguished. Finally, we consider expenditure switching for a robustness check.

5.1 Consumer Gains along the Income Distribution

To compute consumer gains, we use household expenditure shares in 2004, tariff reductions between 2004 and 2019, and tariff pass-through estimates in column (6) of Table 2.[22] As the weighted-average tariff rates decreased from 15.6% in 2004 to 3.3% in 2019, we measure consumer gains across households that would face differential price changes in domestic and imported goods resulting from lowering import tariffs by 12.3 percentage points on average. The percentage change in consumer gains represents the changes in total expenditure relative to the 2004 initial expenditure that would leave household welfare unchanged under a given vector of new retail prices following tariff reductions.

Table 3 reports the results for consumer gains by income decile. The average consumer gain is 3.0%, which amounts to the sum of 1.99% in domestic agricultural goods, 0.38% in imported agricultural goods, 0.12% in domestic manufactured goods, and 0.51% in imported manufactured goods. By disaggregating the gains by origin, we find that domestic and imported goods account for 70% and 30% of total gains, respectively. While domestic agricultural goods have the largest influence, this result is sensible because food consumption accounts largely for expenditure items in Cambodia.

---Table 3 here---

We find that high-income households experience a larger gain. While households at the 0-10 percentile gain by 2.51%, those at the 80-90 percentile gain by 3.50%. Gains for the latter income group is 39% larger than for the former. Although gains are slightly lower for the richest 10% group than for the 80-90 percentile group, the results highlight that tariff reductions are generally pro-rich. By disaggregating the gains by sector and origin, we find that the gains increase with expenditures on manufactured goods, with a prominent impact from imported manufactured goods. Thus, the pro-rich effects are mainly driven by the expenditure share of manufactured imports.

Our results show net pro-rich consumer gains after cancelling out various pro-rich and pro-poor factors in terms of consumption baskets and prices changes. Specifically, richer households consume imported goods in a larger proportion and tariff reductions reduce the prices of imported goods most significantly. Poorer households consume home-produced goods in a larger proportion, and tariff reductions have little effect on the prices of home-produced goods. These factors contribute to generating pro-rich effects. Meanwhile, richer households tend to consume non-traded services such as meals at restaurants and home rents in a large proportion, and the price of services is unchanged by tariff shocks. This factor contributes to pro-poor effects.

Another key determinant of consumer gains is household-specific tariff changes. There is a concern that pro-rich gains may be driven by tariff reductions in favor of richer households. To

[22] Tariff changes are defined as $\hat{\tau}_g = ln(1 + \tau_{g,2019}) - ln(1 + \tau_{g,2004})$.

address this issue, we use equation (9) to compute the terms, $\sum_g \tilde{s}^M_{hg}\hat{\tau}_g$ and $\sum_g \tilde{s}^D_{hg}\hat{\tau}_g$ for each household. We aggregate these measures by income group and report the average tariff reductions for domestic and imported goods across income deciles in Figure 2. We find that tariff reductions are not clearly correlated with income for domestic goods, whereas poorer households face a larger decline in import tariffs for imported goods. Thus, tariff reductions contribute to generating a pro-poor effect, implying that our results are not driven by the specific nature of tariff reductions in Cambodia.

---Figure 2 here---

5.2 Role of Origins

Our welfare measure is distinct from the previous literature in that we distinguish imported, domestically produced, and home-produced goods. To what extent does the distinction of origins matter for the distributional effect of trade liberalization? This question is crucial in understanding a possible bias in previous welfare measurements that do not explicitly account for different origins. To this end, we calculate alternative welfare measures with different assumptions on the availability of the origin information, and examines the question of how the distributional effects change when some origins are not distinguished. Specifically, we consider the following cases.

Case 1: Origin of goods is totally unknown. Suppose that the data provide no information on the origin of goods, but only the total value of expenditures on each goods from all origins. Here, let V^k_{hg} denote the value of expenditure on goods g from origin k, with only information on the total value, $V_{hg} \equiv \sum_k V^k_{hg}$. We define a first measure as follows:

$$\hat{W}^1_h = -\eta \sum_g s_{hg}\hat{\tau}_g, \tag{12}$$

where $s_{hg} = \frac{V_{hg}}{\sum_g V_{hg}}$ is the expenditure share of goods g for household h. Because origin is unknown, a tariff pass-through rate, η, is common for all goods from any origin. It is approximated by the single pass-through estimate in column (3) of Table 2. This measure is commonly used in the existing literature (e.g. Porto, 2006; Nicita, 2009; Han et al., 2016).

Case 2: Only home-produced goods are distinguished from other origins. Given substantial household-production for self-sufficient households in low-income countries, household surveys typically include separate templates for expenditure and the consumption of home-produced goods (Artuc, et al., 2021). In this case, there is information on the consumption of home-produced goods and the total consumption of domestic and imported goods. Researchers must decide whether to include home-produced goods in the denominator of expenditure shares.[23] If home-produced goods are excluded from total expenditures, we define a second measure:

[23] For instance, Ural Marchand (2012) excludes home-produced goods from total expenditures.

$$\hat{W}_h^2 = -\eta \sum_g s_{hg}^{MD} \hat{\tau}_g, \tag{13}$$

where $s_{hg}^{MD} = \frac{V_{hg}^M + V_{hg}^D}{\sum_g (V_{hg}^M + V_{hg}^D)}$. Here, home-produced goods are excluded from both the numerator and denominator in expenditure shares.

In contrast, home-produced goods can be included in total expenditures to compute expenditure shares on each good, with an assumption of zero tariff pass-through rate on their prices. If imported and domestic goods cannot be distinguished, we define a third measure:

$$\hat{W}_h^3 = -\eta \sum_g (s_{hg}^D + s_{hg}^M) \hat{\tau}_g, \tag{14}$$

where $s_{hg}^D = \frac{V_{hg}^D}{\sum_g (V_{hg}^M + V_{hg}^D + V_{hg}^H)}$ and $s_{hg}^M = \frac{V_{hg}^M}{\sum_g (V_{hg}^M + V_{hg}^D + V_{hg}^H)}$ are the expenditure share on domestic and imported goods g for household h, respectively. These shares are computed by including home-produced goods in the denominator. We assume that researchers cannot observe s_{hg}^D and s_{hg}^M separately, but can observe the sum, $s_{hg}^D + s_{hg}^M$.

It is useful to compare $\hat{W}_h^3$ with $\hat{W}_h^2$. Comparing equations (13) and (14) yields the following relationship:

$$\hat{W}_h^3 = (1 - HomeShare_h) \hat{W}_h^2, \tag{15}$$

where $HomeShare_h = \frac{\sum_g V_{hg}^H}{\sum_g (V_{hg}^M + V_{hg}^D + V_{hg}^H)}$ is the expenditure share on home-produced goods for household h. Equation (15) suggests that even if tariffs do not affect the price of home-produced goods, excluding these goods can cause a bias in consumer gains as measured by $\hat{W}_h^2$. As the term $(1 - HomeShare_h)$ is typically larger for richer households, $\hat{W}_h^3$ generates a larger pro-rich effect than $\hat{W}_h^2$. Intuitively, trade liberalization should have a weaker impact on self-sufficient households because the average price in their basket is less sensitive to tariff changes. If there is separate expenditure information on home-produced goods, these goods should be included in total expenditures.

Case 3: Goods from each origin are distinguished. A fourth measure, $\hat{W}_h^4$, is our proposed measurement of consumer gains in equation (8). The key difference between $\hat{W}_h^3$ and $\hat{W}_h^4$ is that we set different pass-through rates for imported and domestic goods. As the pass-through rate for imported goods is larger than domestic goods and import shares increase with income, $\hat{W}_h^4$ can produce a larger pro-rich effect than $\hat{W}_h^3$.

We calculate these measures using 2004 data on Cambodian households. To compare the distributional effects across measures, we regress the variable of consumer gains on a full set of income-decile dummy variables for each measure. Figure 3 shows the coefficients of the income deciles from the regression results, with the coefficient set at zero for the 0–10 decile.[24] These coefficients

[24] The regression results are reported in Table A6.

are comparable in size across measures because consumer gains of any income group are defined relative to the poorest household decile. First, when the origin information is unknown, the result of $\hat{W}_h^1$ shows almost neutral consumer gains: households within the 20–90 income percentile experienced similar consumer gains, and the richest 10% even gain less than the poorest. Second, the result of $\hat{W}_h^2$ indicates slightly pro-rich effects, which appear from the 60-70 percentile. Third, when home-produced goods are distinguished from other origins and the pass-through rates are set to zero, the result of $\hat{W}_h^3$ shows much stronger pro-rich effects than $\hat{W}_h^1$ and $\hat{W}_h^2$. This is consistent with the prediction in equation (15) that richer households spend less on home-produced goods. Finally, when imported and domestic goods are distinguished, the result of $\hat{W}_h^4$ shows even stronger pro-rich effects. Compared with $\hat{W}_h^3$, the difference is due to the larger tariff pass-through for imported goods and higher import shares for richer households. Taken together, incorporating more disaggregate information on origins tends to magnify the pro-rich effects of tariff reductions.

---Figure 3 here---

5.3 Expenditure Switching

Our discussions up to this point have focused on first-order impacts on consumer gains. However, a concern is that the first-order approximation does not account for substitution across goods and origins. If households shift their expenditure toward imported goods with larger tariff reductions, a welfare measure based on initial expenditure shares can underestimate consumer gains from tariff reductions. To address this concern, we take an exact approach and derive consumer gains for a nested non-homothetic CES preference system as in Auer et al. (2024), with the upper nest consisting of goods and the lower nest consisting of varieties from different origins. Details on theoretical derivation and empirical implementation are provided in Appendix E. Substitution patterns in this demand system are governed by two parameters: elasticity of substitution across goods, σ, and elasticity of substitution across origins within a good, ρ.

Following Auer et al. (2024), we measure consumer gains as compensating variations at the initial preference. A convenient property of the non-homothetic CES preference system is that, although the underlying preference is non-homothetic and subject to taste shocks, measuring welfare changes does not require information on specific values of income elasticities and taste shocks (Baqaee and Burstein, 2023). The only two parameters required to compute welfare are the elasticity of substitution across goods and across origins. However, estimating these elasticities requires panel data on households, which are not available for our study. Given the high uncertainty regarding the values of σ and ρ, we treat them as free parameters and compute consumer gains for alternative elasticity values: $\sigma \in \{2, 4, 8, 10\}$ and $\rho \in \{4, 8, 16, 20\}$. For each parameter value, we simulate consumer gains from tariff reductions for the period 2004-2019 for each household.

Table A7 reports the average consumer gains for all households and for each income decile. Each column (1) – (4) corresponds to a different value of σ and ρ, and column (5) showing the results of the first-order approach for comparison. Two findings are evident. First, the average gain in the exact approach ranges between 3.1% and 3.7%, and there is a larger gain under larger elasticities of substitution, consistent with the intuition that consumers gain more when they can shift expenditures across goods and origins. While these gains are larger than the average 3.0% gain in the first-order approach, the results suggest that consumer gains are explained mainly by the first-order effect. Second, consumer gains always increase with household income for any value of elasticities of substitution. For example, the gain for the richest decile is 24%–31% larger than the poorest decile, with a corresponding gain of 32% in the first-order approach. Thus, allowing for substitution across goods and origins further increases consumer gains for all households, but does not overturn our conclusion of pro-rich consumer gains in the first-order approach.

6 Mechanism

Pro-rich consumer gains depend crucially on the fact that richer households spend more on imported goods. Why do import shares increase with household income? To address this question, we argue that trade models with non-homothetic preferences are consistent with our findings in the context of low-income countries. We decompose import-share differences across income groups into "between-sector", "between-goods", and "within-goods" components and show that the relationship of each component with income is consistent with implications from trade models. Finally, we quantify the contribution of each component to the import-share differences.

6.1 Conceptual Framework

Import shares differ across households with varying income levels in terms of their expenditure differences along three dimensions. First, they differ in their expenditure shares across broad sectors (agricultural goods, manufactured goods, and services) which have different import intensities (a *"between-sector effect"*). Second, within a broad sector, they consume goods with different import intensities (a *"between-goods effect"*). Third, within a good, they consume import and domestic varieties in different proportions (a *"within-goods effect"*).

Formally, we can decompose the difference of import shares between income group i and a reference group 0:

$$IMPSH_i - IMPSH_0 = \underbrace{\sum_j (s_{ij} - s_{0j}) IMPSH_{0j}}_{Between-sector} + \underbrace{\sum_j s_{ij} (IMPSH_{ij} - IMPSH_{0j})}_{Within-sector}, \tag{16}$$

where s_{ij} is the share of expenditure on sector j's goods in the total expenditure for group i; $IMPSH_{ij}$ is the share of expenditure on sector j's imported goods in the total expenditure in sector j's goods for group i, i.e. the within-sector import share.[25] Equation (16) decomposes the import-

[25] Details of the derivation are shown in Appendix A4.

share difference between group i and 0 into two components. The first term, $\sum_j (s_{ij} - s_{0j}) IMPSH_{0j}$, captures the between-sector effect. This is the hypothetical difference in import shares between group i and 0 due to their difference in sectoral expenditure shares, assuming that within-sector import shares are identical between the two income groups. The second term, $\sum_j s_{ij}(IMPSH_{ij} - IMPSH_{0j})$, represents the within-sector effect. This is the hypothetical difference in import shares between group i and 0 due to the difference in within-sector import shares, assuming that the sectoral expenditure shares are identical between the two income groups.

We can further decompose the within-sector term in equation (16) into between-goods and within-goods components:

$$IMPSH_{ij} - IMPSH_{0j} = \underbrace{\sum_{g \in j} (s_{ig(j)} - s_{0g(j)}) IMPSH_{0g(j)}}_{Between-goods} + \underbrace{\sum_{g \in j} s_{ig(j)} (IMPSH_{ig(j)} - IMPSH_{0g(j)})}_{Within-goods}, \quad (17)$$

where $s_{ig(j)}$ is the share of expenditure on sector j's goods g in the total expenditure on all goods in sector j for income group i. $IMPSH_{ig(j)}$ is the share of expenditure on imported goods g in the total expenditure on goods g for income group i, i.e., the within-goods import share. The between-goods effect, $\sum_{g \in j}(s_{ig(j)} - s_{0g(j)}) IMPSH_{0g(j)}$, captures the differences of import shares between two income groups due to their differences in consumption across goods within a sector, assuming that within-goods import shares are identical. Meanwhile, the within-goods effect, $\sum_{g \in j} s_{ig(j)}(IMPSH_{ig(j)} - IMPSH_{0g(j)})$, captures the import-share differences due to heterogeneity in within-goods import shares across income groups, assuming that goods-level expenditure shares are identical.

Equations (16) and (17) suggest that the differences in import share across income groups can be understood by examining how the between-sector, between-goods, and within-goods effects vary with income, respectively. The trade literature has provided insights on how these effects can vary across income levels. In terms of the between-sector effect, it is well known that as income rises, households shift their consumption from the agricultural sector toward manufacturing and service sectors (Kongsamut et al., 2001; Comin et al., 2021).[26] The impact of a between-sector shift on import shares is generally ambiguous, depending on the import intensity across these sectors. For instance, if the rich spend more on manufactured than agricultural goods and import intensity is higher for the former, a larger expenditure share on manufactured goods translates into higher import shares for the rich. Meanwhile, if the rich spend more on services than agricultural and manufactured goods, import shares can be smaller for them because services are typically non-traded.

[26]While the expenditure share on manufactured goods generally has a hump-shaped relationship with income across countries, the share monotonically rises with income across households in Cambodia. This suggests that a major proportion of the population in Cambodia may be located at the rising section of the hump.

Regarding the between-goods effect, richer households spend more on income-elastic goods, which are typically imported in low-income countries such as Cambodia. Fieler (2011) and Caron et al. (2014) find a strong empirical regularity that low-income countries tend to export goods with low-income elasticity, suggesting that these countries tend to import goods with high-income elasticity.[27] Thus, the between-goods effect predicts that richer households spend more on income-elastic imported goods and have higher import shares.

In terms of the within-goods effect, richer households tend to purchase high-quality goods, which are typically imported in low-income countries. The literature on quality and trade shows that low-income countries export low-quality goods and import high-quality goods (Hummels and Klenow, 2005; Schott, 2004; Khandelwal, 2010; Fajgelbaum et al., 2011; Hallak and Schott, 2011; Heins, 2023). Thus, the within-goods effect predicts that richer households spend more on high-quality imported varieties and have higher import share.

6.2 Between-sector and Within-sector Effects

To examine the between-sector effect, we classify expenditure items into agricultural goods, manufactured goods, and services at the sector-level. We decompose the import share for income group i into sector-level expenditure shares and import intensity across sector j:

$$IMPSH_i = \sum_j s_{ij} IMPSH_{ij}, \tag{18}$$

where s_{ij} is the share of expenditure on sector j's goods in the total expenditure for group i; $IMPSH_{ij}$ is the share of expenditure on sector j's imported goods in the total expenditure in sector j's goods for group i; i.e., the within-sector import share. Note that sector j consists of multiple goods g.

Table 4 shows the result of equation (18) for year 2004. As income increases, households spend less on agricultural goods and more on manufactured goods and services. Specifically, as household income increases from the 0–10% to 90–100% percentiles, the share of agricultural goods decreases sharply from 77% to 39%. In contrast, the share of manufactured goods increases from 10% to 38% while that of services increases from 13% to 23%. In addition, the average import share is 52% for manufactured goods, 5% for agricultural goods, and 3% for services, suggesting that manufactured goods are most intensively imported. Thus, an increase in household income produces a positive between-sector effect, i.e., an increase in import shares, by inducing an expenditure shift from the low-import-intensity agricultural goods to the high-import-intensity manufactured goods. In contrast, an increase in household income can also yield a negative between-sector

[27] Fieler (2011) finds that low-income countries consume relatively less income-elastic goods and have a comparative advantage in producing goods with low levels of heterogeneity in production technologies. In the data, less income-elastic goods correspond to a goods with less heterogeneous technologies. Caron et al. (2014) find that low-income countries consume relatively less income-elastic goods and have a comparative advantage in less skill-intensive goods. In the data, less income-elastic goods are also less skill-intensive.

effect by inducing an expenditure shift from the high-import-intensity manufactured goods to non-traded services.

---Table 4 here---

Within-sector import shares increase with household income for each broad sector. As household income increases from 0–10% to 90–100% percentiles, the within-sector import share increases from 4% to 10% in the agricultural sector, 42% to 72% in the manufacturing sector, and 2% to 4% in the service sector. Thus, an increase in household income also produces a positive within-sector effect, i.e., an increase in import shares, by inducing households to spend more on imported goods within each sector. Taken together, the positive between-sector and within-sector effects help explain why richer households spend more on imported goods.

6.3 Between-goods and Within-goods Effects

Equation (17) shows that the larger within-sector import shares for the rich can be driven by (i) a larger expenditure on import-intensive goods within a sector, i.e., a positive between-goods effect; and (ii) a higher proportion of expenditures on imported varieties within a good, i.e., a positive within-goods effect. We examine these effects using the 2004 Cambodian household data.

First, a positive between-goods effect suggests that richer households spend more import-intensive goods within a sector. To see this pattern, we estimate an equation for household h and goods g:

$$s_{h,g(j)} = \alpha_0 + \alpha_1 ln(income_h) + \alpha_2 IMPINT_g \times ln(income_h) + f_g + \varepsilon_{hg}, \tag{19}$$

where $s_{h,g(j)}$ is the expenditure share on sector j's goods g in the total expenditure on sector j's goods for household h. $log(income)_h$ is the log of per-capita household expenditure. $IMPINT_g$ is the import intensity of goods g as measured by the share of aggregate expenditure on imported goods g in aggregate expenditure on goods g.[28] f_g is the goods-level fixed effects. ε_{hg} is an error term. We report standard errors clustered by households and use household-level sampling weights.

The coefficient of interest is α_2. A positive sign for α_2 indicates that richer households spend more on import-intensive goods within a sector. Table 5 reports the results for agricultural goods, manufactured goods, and services, respectively. The results in columns (1), (3), and (5) show that the coefficient α_2 is significant and positive for all sectors. In columns (2), (4), and (6), we include household fixed effects to control for unobserved household characteristics. The coefficient α_2 remains unchanged for agricultural and manufactured goods and is not significant for services.

[28] Table A5 shows the goods with the highest and lowest import intensity. In agriculture, whole grain maize, baby milk power, and monosodium glutamate tend to be imported. In manufacturing, gasoline, diesel fuel, motorbikes, and passenger cars tend to be imported.

Thus, we show that richer households tend to spend more on goods with higher import intensity in the agricultural and manufacturing sectors.

---Table 5 here---

Second, a positive within-goods effect suggests that richer households spend more on imported varieties within each good. To see this pattern, we estimate the model:

$$IMPSh_{hg} = \delta_0 + \delta_1 ln(income_h) + \boldsymbol{X_h'}\gamma + f_g + f_p + u_{hg}, \tag{20}$$

where $IMPSh_{hg}$ is the share of expenditure on imported goods g in total expenditure on goods g for household h, i.e., the within-goods import share. $\boldsymbol{X_h}$ is a vector of household-level control variables, including the household head's age and gender, and a dummy variable that takes on unity if the household head speaks a foreign language, and zero otherwise. f_g and f_p are goods-level and province-level fixed effects, respectively. u_{hg} is an error term. We report standard errors clustered by households and use household-level sampling weights.

A positive sign for coefficient δ_1 indicates that the within-goods import share increases with household income. In column (1) of Table 6 without the control variables, the coefficient δ_1 is significant and positive. This result is similar when we include the household-level control variables in column (2). To account for a possibly non-linear relationship between the within-goods import share and income, we use a set of dummy variables for each income decile. In column (3) without the household-level control variables, the coefficients for the 80–90 and 90–100 percentiles are significant and positive. The coefficients for other income percentiles are insignificant. This result is robust when including the household-level control variables in column (4). Thus, the positive relationship between the within-goods import share and income is mostly driven by the top 20% richest households.

---Table 6 here---

6.4 The Contribution of Each Effect

Finally, we assess the contribution of between-sector, between-goods, and within-goods effects to the import share differences across income groups. We substitute equation (17) into (16) to obtain:

$$\begin{aligned} IMPSH_i - IMPSH_0 = & \underbrace{\sum_j (s_{ij} - s_{0j}) IMPSH_{0j}}_{Between-sector} + \underbrace{\sum_j s_{ij} \sum_{g \in j} (s_{ig(j)} - s_{0g(j)}) IMPSH_{0g(j)}}_{Between-goods} \\ & + \underbrace{\sum_j s_{ij} \sum_{g \in j} s_{ig(j)} (IMPSH_{ig(j)} - IMPSH_{0g(j)})}_{Within-goods}. \end{aligned} \tag{21}$$

Equation (21) shows a full decomposition of the import share for income group i relative to a reference group into between-sector, between-goods, and within-goods effects.

Table 7 shows the decomposition result of equation (21) for the 2004 data, with the contribution of the between-sector effect in column (2), between-goods effect in column (3), and within-goods effect in column (4). The result shows that the between-sector and between-goods effects are quantitatively more important, while the within-goods effect plays a smaller role. For example, as household income increases from 0–10% to 90–100% percentiles, the import share increases by 30.8 percentage points: 16.8 percentage points in the between-sector effect, 12.2 percentage points in the between-goods effect, and 1.8 percentage points in the within-goods effect. Thus, the between-sector, between-goods, and within-goods effects explain 54%, 40%, and 6% of the increase in import shares, respectively.[29]

---Table 7 here---

7 Conclusion

This paper introduces the origin of goods to study the welfare and distributional effects of trade liberalization through the expenditure channel. Our theoretical framework explicitly distinguishes imported, domestic, and home-produced goods and provides a parsimonious expression of cost-of-living changes in terms of expenditure shares, tariff changes, and tariff pass-through rates for goods from different origins. Applying this framework to a unique dataset of household expenditures in Cambodia, we find that tariff reductions in the period 2004-2019 produce pro-rich consumer gains, in the sense that richer households experience a larger cost-of-living reduction than do poorer households. Pro-rich gains are driven by consumption heterogeneity and differential price transmissions across origins: richer households spend more on imported goods and less on home-produced goods, and tariff liberalization reduces the price of imported goods more strongly. By comparing alternative measures of consumer gains under different assumptions of the availability of origin information, we demonstrate that disaggregating origins can significantly magnify the inequality in consumption gains between rich and poor households.

Our analysis provides insights for other developing countries in a similar stage of development, where manufactured goods are mostly imported, and a large proportion of the population still live at a subsistence level and rely on home-produced goods for living. In addition to exacerbating inequality in nominal income (Goldberg and Pavcnik, 2007; Pavcnik, 2017), trade liberalization may also increase the cost-of-living inequality between rich and poor. The income and

[29] The small contribution of the within-goods effect may be because expensive manufactured items such as cars, motorbikes, and mobile phones are entirely imported in Cambodia. For a developing country with a relatively broader range of domestic manufacturing industries (e.g., China), the within-goods effect can have a larger contribution. For China's automobile market, Dai and Wang (2022) highlight that within-goods import shares affect the unequal gains from trade.

costs-of-living effects may combine to increase real income inequality in developing countries as observed during the past decades.

References

Amiti, M., O. Itskhoki, and J. Konings (2019). International shocks, variable markups, and domestic prices. *The Review of Economic Studies 86*(6), 2356–2402.

Artuc, E., G. Porto, and B. Rijkers (2019). Trading off the income gains and the inequality costs of trade policy. *Journal of International Economics 120*, 1–45.

Artuc, E., G. Porto, and B. Rijkers (2021). Household impacts of tariffs: data and results from agricultural trade protection. *The World Bank Economic Review 35*(3), 563–585.

Atkeson, A. and A. Burstein (2008). Pricing-to-market, trade costs, and international relative prices. *American Economic Review 98*(5), 1998–2031.

Atkin, D., B. Faber, and M. Gonzalez-Navarro (2018). Retail globalization and household welfare: Evidence from mexico. *Journal of Political Economy 126*(1), 1–73.

Auer, R., A. Burstein, S. M. Lein, and J. Vogel (2024). Unequal expenditure switching: Evidence from switzerland. *Review of Economic Studies*.

Baqaee, D. R. and A. Burstein (2023). Welfare and output with income effects and taste shocks. *The Quarterly Journal of Economics 138*(2), 769–834.

Borusyak, K. and X. Jaravel (2021). The distributional effects of trade: Theory and evidence from the united states. Report, National Bureau of Economic Research.

Breinlich, H., E. Leromain, D. Novy, and T. Sampson (2022). The brexit vote, inflation and uk living standards. *International Economic Review 63*(1), 63–93.

Caron, J., T. Fally, and J. R. Markusen (2014). International trade puzzles: A solution linking production and preferences. *The Quarterly Journal of Economics 129*(3), 1501–1552.

Carroll, D. R. and S. Hur (2020). On the heterogeneous welfare gains and losses from trade. *Journal of Monetary Economics 109*, 1–16.

Comin, D., D. Lashkari, and M. Mestieri (2021). Structural change with long-run income and price effects. *Econometrica 89*(1), 311–374.

Corsetti, G. and L. Dedola (2005). A macroeconomic model of international price discrimination. *Journal of International Economics 67*(1), 129–155.

Cravino, J. and A. A. Levchenko (2017). The distributional consequences of large devaluations. *American Economic Review 107*(11), 3477–3509.

Dai, M. and Y. Wang (2022). Quality and the unequal gains from tariff liberalization. *Available at SSRN 4252090*.

Deaton, A. (1989). Rice prices and income distribution in thailand: a non-parametric analysis. *The Economic Journal 99*(395), 1–37.

Erten, B. and P. Keskin (2024). Trade-offs? the impact of wto accession on intimate partner violence in cambodia. *Review of Economics and Statistics*, 1–12.

Faber, B. and T. Fally (2022). Firm heterogeneity in consumption baskets: Evidence from home and store scanner data. *The Review of Economic Studies 89*(3), 1420–1459.

Fajgelbaum, P., G. M. Grossman, and E. Helpman (2011). Income distribution, product quality, and international trade. *Journal of political Economy 119*(4), 721–765.

Fajgelbaum, P. D. and A. K. Khandelwal (2016). Measuring the unequal gains from trade. *The Quarterly Journal of Economics 131*(3), 1113–1180.

Fieler, A. C. (2011). Nonhomotheticity and bilateral trade: Evidence and a quantitative explanation. *Econometrica 79*(4), 1069–1101.

Glewwe, P., N. Agrawal, and D. Dollar (2004). *Economic growth, poverty, and household welfare in Vietnam*. World Bank Publications.

Goldberg, P. K. and N. Pavcnik (2007). Distributional effects of globalization in developing countries. *Journal of economic Literature 45*(1), 39–82.

Hallak, J. C. and P. K. Schott (2011). Estimating cross-country differences in product quality. *The Quarterly journal of economics 126*(1), 417–474.

Han, J., R. Liu, B. U. Marchand, and J. Zhang (2016). Market structure, imperfect tariff pass-through, and household welfare in urban china. *Journal of International Economics 100*, 220–232.

Heins, G. (2023). Endogenous vertical differentiation, variety, and the unequal gains from trade. *Review of Economics and Statistics 105*(4), 910–930.

Hottman, C. J. and R. Monarch (2020). A matter of taste: Estimating import price inflation across us income groups. *Journal of International Economics 127*, 103382.

Hummels, D. and P. J. Klenow (2005). The variety and quality of a nation's exports. *American economic review 95*(3), 704–723.

Khandelwal, A. (2010). The long and short (of) quality ladders. *The Review of Economic Studies 77*(4), 1450–1476.

Kongsamut, P., S. Rebelo, and D. Xie (2001). Beyond balanced growth. *The Review of Economic Studies 68*(4), 869–882.

Kovak, B. K. (2013). Regional effects of trade reform: What is the correct measure of liberalization? *American Economic Review 103*(5), 1960–1976.

Nicita, A. (2009). The price effect of tariff liberalization: Measuring the impact on household welfare. *Journal of Development Economics 89*(1), 19–27.

Nicita, A., M. Olarreaga, and G. Porto (2014). Pro-poor trade policy in sub-saharan africa. *Journal of International Economics 92*(2), 252–265.

Nigai, S. (2016). On measuring the welfare gains from trade under consumer heterogeneity. *The Economic Journal 126*(593), 1193–1237.

Pavcnik, N. (2017). The impact of trade on inequality in developing countries. Report, National Bureau of Economic Research.

Porto, G. G. (2006). Using survey data to assess the distributional effects of trade policy. *Journal of International Economics 70*(1), 140–160.

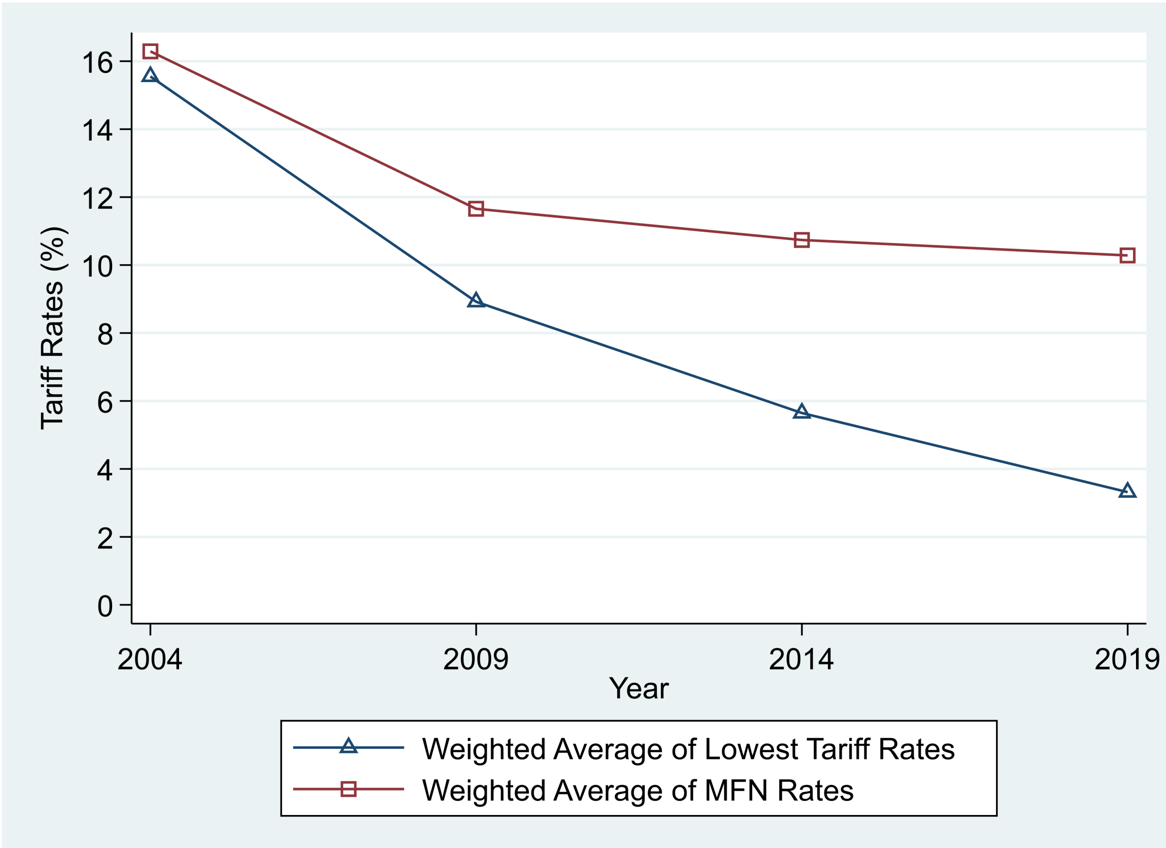
Schott, P. K. (2004). Across-product versus within-product specialization in international trade. *The Quarterly Journal of Economics 119*(2), 647–678.

Teti, F. A. (2020). 30 years of trade policy: Evidence from 5.7 billion tariffs. Report, ifo Working Paper.

Ural Marchand, B. (2012). Tariff pass-through and the distributional effects of trade liberalization. *Journal of Development Economics 99*(2), 265–281.

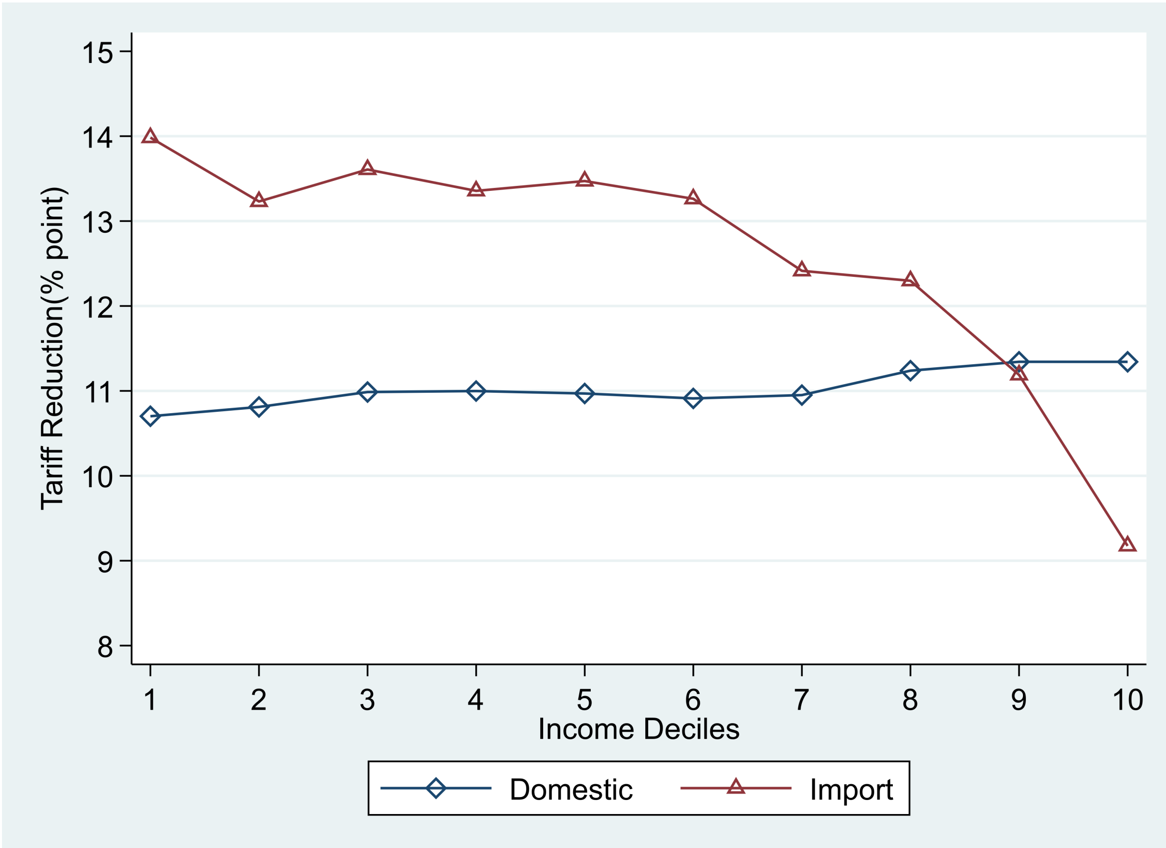
WTO (2017). Trade policy reivew: Cambodia.

Figure 1: Import Tariff Rates in Cambodia



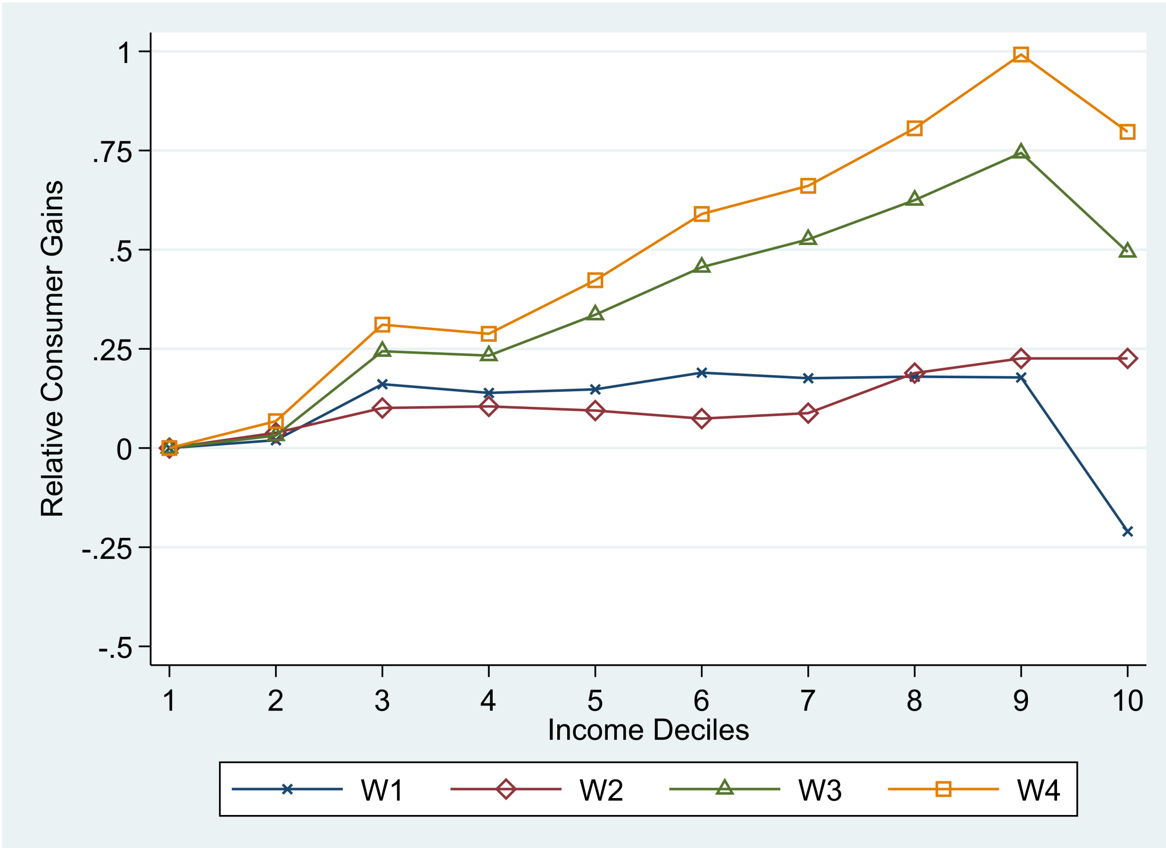
Notes: Lowest tariff rates are either MFN or preferential tariff rates.
Source: Authors' calculation using the WTO's Tariff Download Facility and FTA document.

Figure 2: Tariff Reductions in Domestic and Imported goods across Income Groups



Notes: Household-specific tariff reductions during 2004-2019 for import and domestic goods are calculated based on equation (9).
Source: Authors' calculations.

Figure 3: Unequal Consumer Gains under Different Welfare Measures



Notes: The figure reports the consumer gains of an income decile relative to the poorest income decile, captured by the coefficients of income decile dummies on which we regress cost-of-living changes expressed in percentage points. W1, W2, W3, and W4 represent the corresponding welfare measures with different assumptions on the availability of the origin information. W1: origin is totally unknown; W2: home-produced goods are distinguished from other origins and excluded from total expenditure; W3: home-produced goods are distinguished from other origins and included in total expenditure. W4: All origins are distinguished. See detailed descriptions in section 5.2.

Table 1: Expenditure Shares by Origin across Income Groups

Income Percentile	Average Income in USD	Origin of Goods		
		Home	Domestic	Import
0-10	10.8	32.3	60.9	6.8
10-20	14.5	32.0	59.2	8.8
20-30	17.0	29.1	61.5	9.3
30-40	19.7	26.8	62.9	10.4
40-50	19.6	27.7	62.2	10.2
50-60	25.6	22.0	64.2	13.8
60-70	29.7	18.1	65.3	16.5
70-80	36.1	14.5	64.7	20.8
80-90	48.7	8.9	64.1	27.0
90-100	99.1	4.2	57.3	38.4
All	32.1	21.7	62.2	16.1

Notes: This table reports the expenditure share in percentage on home-produced, domestic, and imported goods for each income decile in the 2004 CSES data. Average income is measured by the mean of per capita household monthly expenditure on food, nonfood, utility, and housing in each income interval. Expenditure values in Cambodian riels are divided by 4,000 to obtain the USD values. Per capita household is based on the adult equivalent adjusted household size (= 1 + 0.7×(A-1) + 0.5×K), where A is the number of adults (over 15 years old) and K is the number of children in a corresponding household. Each household is weighted by sampling weights.

Table 2: Regression Results of Tariff Pass-through Rates

Dep var.: $Ln(Price_{hgkt})$	(1)	(2)	(3)	(4)	(5)	(6)
$Ln(1 + tariff_{gt})$	0.324*	0.323*	0.354*	0.353*	0.126	0.127
	(0.190)	(0.190)	(0.190)	(0.190)	(0.49)	(0.49)
$Ln(1 + tariff_{gt}) \times Import_k$	0.308***	0.304***				
	(0.101)	(0.101)				
$Ln(WorldPrice)_{gt}$		0.0111		0.0116		-0.00125
		(0.0152)		(0.0152)		(0.0231)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Product-unit FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-year FE					Yes	Yes
Province-origin-year FE	Yes	Yes	Yes	Yes		
No. of observations	1,547,468	1,545,776	1,547,468	1,545,776	196,799	196,799
R-squared	0.941	0.941	0.941	0.941	0.952	0.952
p-values for H0: $\beta 1 + \beta 2 = 0$	0.003	0.003				
Sample of goods by origin						
Home production					Yes	Yes
Domestic production	Yes	Yes	Yes	Yes		
Import	Yes	Yes	Yes	Yes		

*Notes: This table reports the regression results of equation (11). The dependent variable is log price at household-goods-origin level. Import is a dummy for imported goods. Sample in columns (1)-(4) includes only domestic and imported goods. Sample in columns (5) and (6) includes only home-produced goods. Parentheses report standard errors clustered by goods-province pairs. Constant is not reported. Each observation is weighted by sampling weights. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.*

Table 3: Consumer Gains from Trade Liberalization across Income Groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Income	Consumer	Import			Domestic		
Percentile	Gains	Total	Agriculture	Manufacture	Total	Agriculture	Manufacture
0-10	2.51	0.57	0.36	0.22	1.94	1.88	0.06
10-20	2.58	0.65	0.36	0.30	1.93	1.84	0.09
20-30	2.82	0.75	0.36	0.39	2.07	1.98	0.09
30-40	2.80	0.73	0.38	0.34	2.07	1.97	0.10
40-50	2.93	0.81	0.38	0.43	2.12	2.01	0.11
50-60	3.10	0.93	0.39	0.54	2.17	2.05	0.13
60-70	3.17	0.94	0.39	0.55	2.23	2.11	0.12
70-80	3.32	1.06	0.39	0.67	2.26	2.11	0.15
80-90	3.50	1.21	0.40	0.81	2.29	2.12	0.17
90-100	3.31	1.28	0.39	0.89	2.02	1.82	0.20
All	3.00	0.89	0.38	0.51	2.11	1.99	0.12

Notes: This table reports the percentage change in cost-of-living from import tariff reductions between 2004 and 2019, which is calculated in equation (8). Column (1) reports consumer gains for each income decile; columns (2)-(7) break down the consumer gains in column (1) by sector and origin.

Table 4: Sectoral Expenditure Shares and Within-sector Import Shares across Income Groups

Income	Agricultural goods		Manufactured goods		Services	
Percentile	Exp. Share	Import Share	Exp. Share	Import Share	Exp. Share	Import Share
0-10	77.4	3.7	9.7	42.1	12.9	2.4
10-20	74.7	3.9	11.8	46.7	13.5	2.3
20-30	74.0	4.0	12.4	45.7	13.6	2.0
30-40	72.5	4.6	13.3	47.6	14.3	2.6
40-50	72.6	4.7	13.0	45.7	14.3	2.8
50-60	68.3	4.8	16.7	49.9	15.1	2.9
60-70	65.5	5.5	19.0	52.0	15.5	3.4
70-80	60.8	6.1	22.8	55.2	16.4	3.6
80-90	53.0	7.4	27.9	62.6	19.1	3.4
90-100	39.4	9.6	37.7	72.6	22.9	3.8
All	65.8	5.4	18.4	52.0	15.7	2.9

Notes: This table reports the expenditure shares (%) and within-sector import shares (%) of agricultural goods, manufactured goods, and services for each income decile in the 2004 CSES data. The within-sector import share is the share of expenditure on sector j's imported goods in total expenditure in sector j's goods for income group i. See equation (16) for details.

Table 5: Within-sector Expenditure Shares, Import Intensity, and Income

Dep. Var.: $s_{h,g(j)}$ (%)	(1)	(2)	(3)	(4)	(5)	(6)
$Ln(income_h)$	-0.48***		-0.53***		-4.83***	
	(0.016)		(0.018)		(0.21)	
$Ln(income_h) \times IMPINT_g$	0.011***	0.010***	0.0092***	0.0092***	0.080***	-0.024
	(0.00055)	(0.00056)	(0.00031)	(0.00031)	(0.022)	(0.028)
Goods fixed effects	Y	Y	Y	Y	Y	Y
Household fixed effects		Y		Y		Y
No. of observations	384,870	384,870	1,395,000	1,395,000	36,423	34,400
R-squared	0.54	0.55	0.12	0.12	0.35	0.37
Sample	Agriculture		Manufacture		Service	

Notes: This table reports the regression results of equation (19). The dependent variable is the expenditure share (%) on sector j's goods g in total expenditure on sector j's goods g for household h. $Ln(income_h)$ *is log of per-capita household expenditure.* $IMPINT_g$ *is the import intensity of goods g measured by the share of aggregate expenditure on imported goods g in aggregate expenditure on goods g in the 2004 data. All columns include goods fixed effects. Columns (2), (4), and (6) include household fixed effects. Parentheses report standard errors clustered by households. Constant is not reported. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.*

Table 6: Within-goods Import Shares and Income

Dep. Var.: $IMPSh_{hg}$ (%)	(1)	(2)	(3)	(4)
$Ln(income_h)$	0.91***	0.83***		
	(0.14)	(0.15)		
Income percentile 10-20			-0.29	-0.30
			(0.29)	(0.29)
Income percentile 20-30			-0.46	-0.47
			(0.30)	(0.30)
Income percentile 30-40			0.18	0.17
			(0.30)	(0.30)
Income percentile 40-50			0.25	0.23
			(0.31)	(0.31)
Income percentile 50-60			-0.15	-0.17
			(0.31)	(0.31)
Income percentile 60-70			-0.15	-0.15
			(0.33)	(0.33)
Income percentile 70-80			0.33	0.28
			(0.33)	(0.33)
Income percentile 80-90			0.95***	0.89**
			(0.35)	(0.35)
Income percentile 90-100			1.77***	1.62***
			(0.36)	(0.37)
Household head's age		-0.023***		-0.023***
		(0.0051)		(0.0051)
Male household head		-0.012		-0.019
		(0.18)		(0.18)
Foreign-language speaking head		0.78***		0.77***
		(0.25)		(0.25)
Goods fixed effects	Y	Y	Y	Y
Province-level fixed effects	Y	Y	Y	Y
No. of observations	472,957	472,945	472,957	472,945
R-squared	0.57	0.57	0.57	0.57

*Notes: This table reports the regression result of equation (20). $IMPSh_{hg}$ is the within-goods import share (%) defined as the share of expenditure on imported goods g in total expenditure on goods g for household h. $Ln(income_h)$ is log of per-capita household expenditure. Columns (3) and (4) include income decile dummies; all regressions include goods and province fixed effects. Parentheses report standard errors clustered by households. Constant is not reported. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.*

Table 7: Decomposition of Import Shares

Income Percentile	(1) $IMPSH_i - IMPSH_0(\%)$	(2) Between-sector effect	(3) Between-goods effect	(4) Within-goods effect
0-10	-9.23	-5.23	-3.45	-0.55
10-20	-7.26	-3.97	-2.75	-0.53
20-30	-6.69	-3.63	-2.43	-0.64
30-40	-5.81	-3.20	-2.62	0.02
40-50	-4.77	-2.31	-2.26	-0.19
50-60	-2.25	-1.04	-1.30	0.09
60-70	0.40	0.35	0.25	-0.20
70-80	4.71	2.66	1.83	0.21
80-90	10.97	5.72	4.59	0.66
90-100	21.55	11.55	8.78	1.22

Notes: This table reports the result of equation (21) that decomposes import shares into between-sector, between-goods, and within-goods components using the 2004 CSES data. Column (1) reports the import share of income group i relative to the mean import share for all households.

Appendix

Appendix A: Theoretical Derivations

A1. Derivation of equation (9)

Let M_{hg} and D_{hg} denote the expenditure of household h on imported and domestic goods g, respectively. E_h denotes total expenditure for household h. Equation (9) can be written as:

$$\hat{W}_h = -(\eta^M \sum_g \frac{M_{hg}}{E_h}\hat{\tau}_g + \eta^D \sum_g \frac{D_{hg}}{E_h}\hat{\tau}_g) \tag{A1}$$

$$= -[\eta^M \sum_g (\frac{\sum_g M_{hg}}{E_h})(\frac{M_{hg}}{\sum_g M_{hg}})\hat{\tau}_g + \eta^D \sum_g (\frac{\sum_g D_{hg}}{E_h})(\frac{D_{hg}}{\sum_g D_{hg}})\hat{\tau}_g]$$

$$= -[\eta^M (\frac{\sum_g M_{hg}}{E_h}) \sum_g (\frac{M_{hg}}{\sum_g M_{hg}})\hat{\tau}_g + \eta^D (\frac{\sum_g D_{hg}}{E_h}) \sum_g (\frac{D_{hg}}{\sum_g D_{hg}})\hat{\tau}_g]$$

$$= -[\eta^M IMPSH_h (\sum_g s^M_{hg}\hat{\tau}_g) + \eta^D DOMSH_h (\sum_g s^D_{hg}\hat{\tau}_g)]$$

where $IMPSH_h \equiv (\sum_g M_{hg})/E_h$ is the expenditure share on imported goods. We will call it "import share of household h". Similarly, $DOMSH_h \equiv (\sum_g D_{hg})/E_h$, the "domestic share", is household expenditure share on domestic goods. Note that the sum of $IMPSH_h$ and $DOMSH_h$ may not necessarily equal to 1 because some households also consume home-produced goods. $s^M_{hg} = M_{hg}/(\sum_g M_{hg})$ is the expenditure share of imported goods g in total expenditures on imported goods. Similarly, $s^D_{hg} = D_{hg}/(\sum_g D_{hg})$ is the expenditure share of domestic goods g in total expenditures on domestic goods.

A2. Import share as a sufficient statistic

Our framework does not assume any restrictions in the market structure of the economy and on the extent of tariff reductions across goods. If we assume that (i) market structure is perfect competition or monopolistic competition, which means that tariff pass-through rate is one for the imported goods and zero for the domestic goods ($\eta^M = 1$ and $\eta^D = 0$), and (ii) all goods have the same tariff reduction, $\hat{\tau}_g = \hat{\tau}$, then equation (9) is reduced to:

$$\hat{W}_h = -IMPSH_h \hat{\tau} \tag{A2}$$

In this case, household's import share is a sufficient statistic to measure welfare gains from tariff changes, as in Borusyak and Jaravel (2021).

A3. Traded and non-traded sectors

When prices in a non-traded sector do not respond to tariffs, a cost-of-living change in equation (8) can be expressed as:

$$\hat{W}_h = -(\eta^M \sum_{g \in T} s^M_{hg} \hat{\tau}_g + \eta^D \sum_{g \in T} s^D_{hg} \hat{\tau}_g) \tag{A3}$$

where T denotes a traded sector. Let M_{hg} and D_{hg} denote an expenditure for household h on import and domestic goods g, respectively, and E_h denotes a total expenditure for household h. Equation (A3) can be re-written as:

$$\begin{aligned}
\hat{W}_h &= -(\eta^M \sum_{g \in T} \frac{M_{hg}}{E_h} \hat{\tau}_g + \eta^D \sum_{g \in T} \frac{D_{hg}}{E_h} \hat{\tau}_g) \\
&= -(\eta^M \sum_{g \in T} \frac{E^T_h}{E_h} \frac{M_{hg}}{E^T_h} \hat{\tau}_g + \eta^D \sum_{g \in T} \frac{E^T_h}{E_h} \frac{D_{hg}}{E^T_h} \hat{\tau}_g) \\
&= -TradedSH_h(\eta^M \sum_{g \in T} s^{MT}_h \hat{\tau}_g + \eta^D \sum_{g \in T} s^{DT}_h \hat{\tau}_g)
\end{aligned} \tag{A4}$$

where $E^T_h = \sum_{g \in T}(M_{hg} + D_{hg} + H_{hg})$is the expenditure on goods in the traded sector for household h, and $TradedSH_h = E^T_h / E_h$ is the expenditure share on traded-sector goods. $s^{MT}_h = M_{hg} / E^T_h$ is the share of imported goods g in household's expenditure on all traded-sector goods, and $s^{DT}_h = D_{hg} / E^T_h$ is the share of domestic goods g in household's expenditure on all traded-sector goods.

A4. Import share decomposition

This section describes how to decompose import shares into between-sector and within-sector components, and further decompose the within-sector effect into between-goods and within-goods components. Define the import share of income group relative to a reference good 0 as follows:

$$IMPSH_i - IMPSH_0 = \sum_j s_{ij} IMPSH_{ij} - \sum_j s_{0j} IMPSH_{0j} \tag{A5}$$

Where $s_{ij} = \frac{E_{ij}}{\sum_j E_{ij}}$ is the expenditure share of sector j for group i, and $IMPSH_{ij} = M_{ij} / E_{ij}$ is the within-sector import share. Add and subtract $\sum_j s_{ij} IMPSH_{0j}$ on the right-hand side of equation (A5) and collect terms yields equation (16) in the main text.

Similarly, the within-sector import share differences between income group i and group 0 can be written as:

$$IMPSH_{ij} - IMPSH_{0j} = \sum_{g \in j} s_{ig(j)} IMPSH_{ig(j)} - \sum_{g \in j} s_{0g(j)} IMPSH_{0g(j)} \tag{A6}$$

where $s_{ig(j)} = \frac{E_{ig}}{\sum_{g\in j} E_{ig}}$ is the share of good g in the expenditure of all goods in sector j for group i, and $IMPSH_{ig(j)} = M_{ig}/E_{ig}$ is the within-good import share for group i and good g in sector j. Adding and subtracting $\sum_{g\in j} s_{ig(j)} IMPSH_{0g(j)}$ on the right-hand side of equation (A6) yields equation (17) in the main text.

Appendix B: Data Cleaning of Diary Data

Diary data in the CSES record a vast number of household expenditure transactions and consumption of own-produced goods. As households report a large number of their individual transactions for a survey period, the raw data can contain nontrivial errors in transaction records in terms of unit, quantity, and value. However, it is difficult to check manually what errors are contained in individual transactions. To systematically clean the diary data, we process following steps.

First, the diary records a number of items such as vegetables, processed foods, electronic appliances, and services. Enumerators report the unit of quantity for each item in all household transactions from unit codes: (1) units/pieces, (2) packs/boxes, (3) kilograms, (4) grams, (5) liters, (6) milliliters, (7) hands (e.g. of bananas), (8) bunches (e.g. of firewood), (9) bowls (i.e. prepared meals), (10) no unit (in monetary values), and (11) other. In the diary data, similar items are reported in various units of quantity and recorded in incorrect units of quantity: e.g., papaya in liters, salt in liters, and repair of household appliances in kilo. To correct units of quantity, we compute the frequency of units for each item and keep only observations with frequently recorded units. While measurement errors should be small for the observations with most frequently reported units, keeping only one major unit removes a substantial number of observations. Thus, we keep the observations with four frequent units in each item.

Second, information on quantity and value allows us to compute unit values for individual transactions. On examination, some unit values appear to be measured with a large deviation even within similar goods-unit groups. Extremely large and small unit values indicate possible errors in expenditure quantity and/or value. We find that such issues tend to be serious for the goods-unit groups with a smaller number of observations. To exclude possible outliers in terms of unit values, we focus on the goods-unit groups with less 50 observations and drop the observations with bottom and top 1 percentiles of unit values in each group.

Third, we check remaining transactions in the sample manually and further exclude the observations with errors in quantity unit; e.g., sweet potato in milliliters, soft drinks in kilograms, and clothing in liters. Next, we check expenditures on expensive durable goods such as bicycles. Since these goods can contain large errors in values, we drop the observations with bottom and top 10 percentiles of unit values in each group. Additionally, we correct the unit of quantity for all expenditures on fuels, including gasoline, diesel fuel, motor oil, LPG for cars, and other fuels. For each goods-unit group, we drop the observations with bottom and top 5 percentiles of unit values in each group.

Finally, we replace diary's expenditures on housing rent, car, and motorcycle with corresponding expenditures in recall questions because these items can explain a large share of household expenditures but are rarely recorded in the diary survey. For rents, we use the half of monthly rents to be consistent with diary expenditures in two weeks and define the origin as domestic production, with details in Appendix C. For cars and motorcycles, a section on durable goods asks a question on the new purchase of these items within the last 12 months, including the number and value of purchased items. The origin of these goods is defined as imported from abroad because the Cambodian Economic Census in 2011 shows no domestic production in these sectors.

The summary of the diary data in Appendix Table 1 sheds light on the structure of household expenditures. While the average number of expenditure transactions per household is different across surveys, we describe average household expenditures from the diary data in 2009, which have the largest number of recorded transactions. On average, households purchase 155 agricultural goods, 23 manufactured goods, and 19 services. The number of unique items per household is around 39.8 for agricultural goods, 4.0 for manufactured goods, and 3.3 for services. Thus, households consume agricultural goods most frequently and spend on manufacture goods and services less frequently. Among these items, the number of import items is 3.6 for agricultural goods and 2.0 for manufactured goods, suggesting that the tendency to purchase imported goods is higher for manufactured goods than for agricultural goods.

Appendix C: Estimation of Housing Rents

The CSES survey has a section on housing to collect information on the characteristics of dwelling in which household members reside. The survey asks questions about the floor area, the number of rooms, and construction materials on wall, roof, and floor of the housing. It also includes questions on housing facilities such as lighting and drinking water. Households are asked about the legal status of the dwelling and answer one of following items: (1) owned by the household, (2) not owned but no rent is paid, (3) rented, and (4) other. For households answering the item (3), they answer the monthly rent of their housing in the last month. For households answering the items (1) and (2), they are asked a hypothetical question; how much you would have to pay per month to rent a similar dwelling. In our analysis, we use the value of actual and self-evaluated rents from these questions. In this respect, we assume that homeowners can correctly estimate rental equivalences even in the absence of comparable rental housing in their neighborhoods.

However, the 2004 survey has a question only on actual rents paid by households and lacks a hypothetical question on the value of self-evaluated rents. As housing rents are a relatively large part of household expenditure, it is crucial to account for housing rents in constructing a proxy for permanent income. For this reason, we adopt a hedonic approach to impute missing values on rents for owner-occupied dwellings in 2004. While a housing rent is modeled as a function of the dwelling characteristics such as house construction and location, there is no shared consensus as to a specific form of hedonic price function (Balczar, et al., 2017). For household h and year t, we use the following log-linear regression model:

$$lnR_{ht} = X_{ht}^{'}\boldsymbol{\beta} + f_{r(h)} + f_t + \varepsilon_{ht} \tag{C1}$$

where R_{ht} is a measure of actual rents or self-evaluated rents. X_{ht} is a vector of variables on housing characteristics including the floor area, number of rooms, a dummy for publicly provided electricity, a dummy for piped water, and fixed effects for construction materials in wall, roof, and floor. $f_{r(h)}$ is a district-level fixed effect, and f_t is a year fixed effect. ε_{ht} is an error term.

Using data in 2004, 2009, 2014, and 2019, we estimate the equation (C1) and report the estimation result in Table A2, with a scatter plot in Figure A2. Using the estimated coefficients, we predict rents for owner-occupied dwellings in 2004 out of sample.

Reference

Balczar, C. F., Ceriani, L., Olivieri, S., and Ranzani, M. 2017. Rent-imputation for welfare measurement: A review of methodologies and empirical findings. *Review of Income and Wealth*, 63(4), 881-898.

Appendix D: Data Sources and Construction of Tariff Rates

Data on applied MFN tariffs in Cambodia come from the WTO's Tariff Download Facility, which provides tariff data at the HS 6-digit based on the WTO Integrated Data Base (IDB). Applied MFN tariffs in Cambodia are reported for 2002-2003 in the HS 1996 nomenclature, 2005-2008 in the HS 2002 nomenclature, 2009-2012 in the HS 2007 nomenclature, and 2014 and 2016 in the HS 2012 nomenclature, and 2017 and 2019 in the HS 2017 nomenclature. Since MFN data in 2004 are missing, we use 2003 data for MFN in 2004.

As we use the HS 2007 nomenclature as a benchmark tariff classification, some HS 6-digit codes in other HS nomenclatures are matched with the HS codes in the HS 2007 nomenclature by using a concordance table from the WTO tariff data. For multiple matches with the HS 2007 codes, we use the first matched codes.

For preferential tariffs, we refer to original documents on the schedule of tariff reductions that Cambodia had committed to implement in the following trade agreements on goods; (1) ASEAN-Australia-New Zealand FTA (AANZFTA) that entered into force on January 2010; (2) ASEAN-China FTA (ACFTA) that entered into force on January 2005; (3) ASEAN-India FTA (AIFTA) that entered into force on January 2010; (4) ASEAN-Japan Comprehensive Economic Partnership (AJCEP) that entered into force on December 2008; (5) ASEAN-Republic of Korea FTA (AKFTA) that entered into force on June 2007. Since these documents do not report tariff rates for all the years, we use 2013 data for 2014 and 2018 data for 2019 in the ACFTA, and 2012 data for 2014 and 2018 data for 2019 in the AKFTA.

For Cambodia's imports from ASEAN countries, importers could use preferential treatment in the ASEAN Free Trade Area that entered into force from January 1993. We use the WTO tariff data to construct applied preferential tariff rates as reported as free-trade agreement duty rates for ASEAN countries. Some data on ASEAN preferential tariffs are missing at the HS 6-digit level in the WTO data, and we assume that specific preferential tariffs on these goods are not reported by the Cambodian government. In this case, we assume that these imports from ASEAN countries entered Cambodia under MFN tariffs; their shares in around 5,200 HS codes are 68.9% in 2003, 12.5% in 2008, 16.6% in 2014, and 16.0% in 2019. Since ASEAN preferential tariffs are not reported for all the years, we use 2003 data for 2004 and 2008 data for 2009.

Appendix E: Consumer Gains with Substitution across Goods and Origins

E1. Setup

We adopt a nested non-homothetic CES demand system following Auer et al. (2024). For household h, good g, and time t, the utility of a household, u_{ht}, is defined implicitly by:

$$u_{ht} = [\sum_{g}(\zeta_{hg}u_{ht}^{\gamma_g})^{\frac{1}{\sigma}}(c_{hgt})^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \tag{E1}$$

where c_{hgt} denotes the expenditure of household h on good g in time t. ζ_{hg} represents household-good specific taste shocks. γ_g is a good-specific parameter capturing the income elasticity of each good g, and σ is the elasticity of substitution across goods.

For origin $k \in \{M, D, H\}$, the expenditure on each good, c_{hgt}, consists of consumption of varieties from different origins, c_{hgkt}, combined with a non-homothetic CES aggregator:

$$c_{hgt} = [\sum_{k}(\zeta_{hgkt}u_{ht}^{\gamma_{gk}})^{\frac{1}{\rho}}(c_{hgkt})^{\frac{\rho-1}{\rho}}]^{\frac{\rho}{\rho-1}} \tag{E2}$$

where ζ_{hgk} and γ_{gk} are taste shocks and income-elasticity parameters, respectively. ρ is the elasticity of substitution across origins within a good.

We define welfare change as the compensating variation, CV_h, evaluated at initial preferences, as in Auer et al. (2024). The compensating variation measures the change in nominal income (in logs) under the final budget set that would leave the household with initial preferences as well-off as under the initial budget set. Let t=0,1 denote the time period before and after a policy change, respectively. We can write CV_h as a function of changes in nominal income and cost-of-living as follows:

$$CV_h = log(\frac{I_{ht1}}{I_{ht0}}) - log[\frac{e_h(\boldsymbol{p_{ht1}}, u_{ht0}, \zeta_{ht0})}{e_h(\boldsymbol{p_{ht0}}, u_{ht0}, \zeta_{ht0})}] \tag{E3}$$

where I_{ht} denotes household income and $e_h(\boldsymbol{p_{ht}}, u_{ht}, \zeta_{ht})$ is the expenditure function associated with preference in (E1) and (E2). The first term, $log(\frac{I_{ht1}}{I_{ht0}})$, captures the changes in nominal household income. The second term, $log[\frac{e_h(\boldsymbol{p_{ht1}}, u_{ht0}, \zeta_{ht0})}{e_h(\boldsymbol{p_{ht0}}, u_{ht0}, \zeta_{ht0})}]$, captures the changes in the cost-of-living. Since we focus on consumer gains, we assume there are no income changes: i.e., $log(\frac{I_{ht1}}{I_{ht0}}) = 0$.

Auer et al. (2024) show that under the nested non-homothetic CES demand system described by equations (E1) and (E2), log changes in the cost-of-living can be expressed as the following price indices (often referred to as Llyod-Moulton index):

$$CV_h = -\frac{1}{1-\sigma}log[\sum_{g} b_{hgt0}(\hat{P}_{hg})^{1-\sigma}] \tag{E4}$$

where

$$\hat{P}_{hg} = [\sum_k \frac{b_{hgkt0}}{b_{hgt0}} (\hat{p}_{hgk})^{1-\rho}]^{\frac{1}{1-\rho}} \tag{E5}$$

b_{hgkt0} is the expenditure share on good g from origin k for household h at initial periodt_0. $b_{hgt0} = \sum_k b_{hgkt0}$ is the expenditure share on good g from all origins. $\hat{p}_{hgk} = p_{hgk}/p_{hgkt0}$ is the exact-hat algebra price change. In words, the change in the cost-of-living is equal to the average price changes for each good from each origin, weighted by their initial expenditure shares, aggregated through a CES aggregator accounting for the elasticity of substitution across both goods and origins.

A convenient property of the price index in equation (E4) is that, although the underlying preference is non-homothetic and subject to taste shocks, measuring welfare changes does not require the information on the value of income elasticities γ_{gk} and taste shocks ζ_{hgk}, which can vary by goods and origins. The elasticities of substitution across goods, σ, and across origins, ρ, are the only two parameters required to compute CV_h.

E2. Empirical Implementation

To obtain $\hat{p}_{hgk}$, we calculate the counterfactual price change induced by tariff reductions for each good and origin. Specifically, if tariff pass-through rate for goods from origin k is β_k, we obtain:

$$dlog p_{gk} = \beta_k dlog(1 + \tau_g) \tag{E6}$$

Rearranging equation (5) gives:

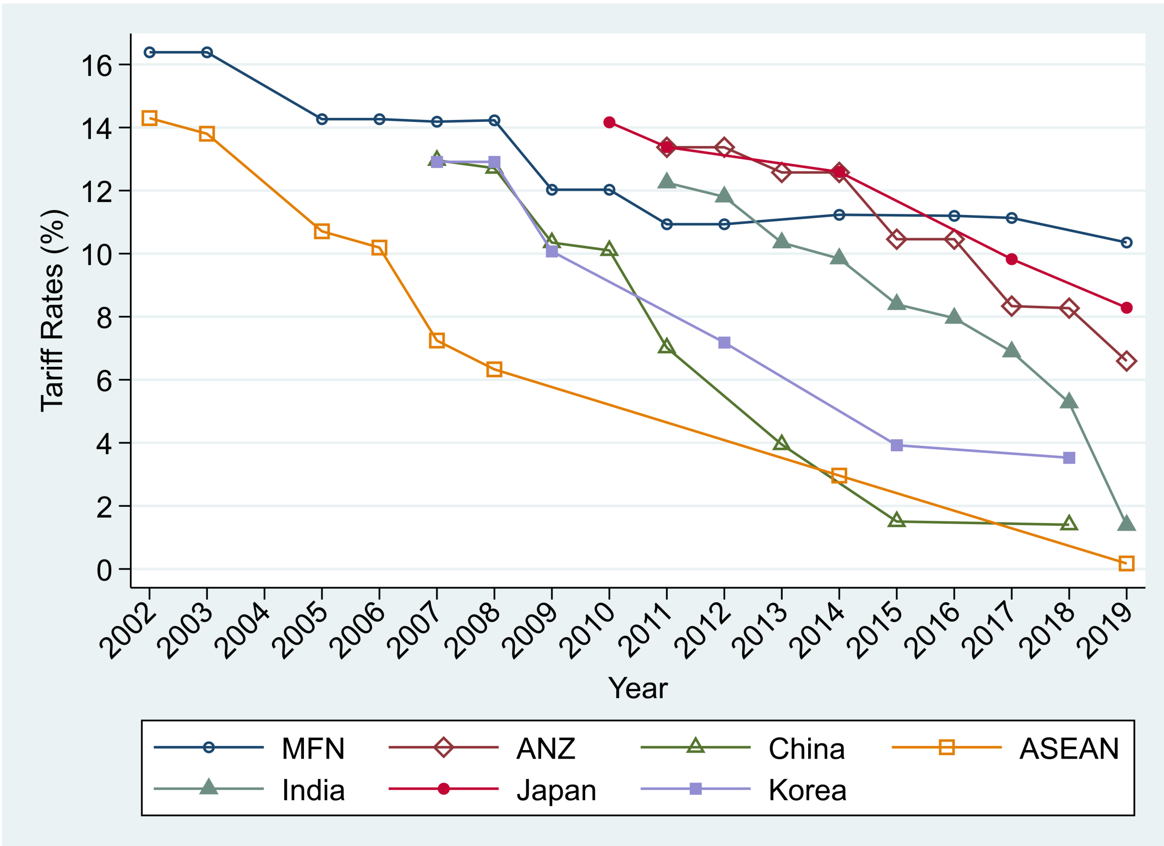
$$\hat{p}_{gk} = \frac{p_{gkt1}}{p_{gkt0}} = (\frac{1 + \tau_{gt1}}{1 + \tau_{gt0}})^{\beta_k} \tag{E7}$$

where τ_{gt1} is the tariff rate in 2019 and τ_{gt0} is the tariff rate in 2004. We use the estimated β_k in column (6) of Table 2 for each origin: β_M=0.627 for imported goods, β_D=0.323 for domestic goods, and β_H=0 for home-produced goods. For services, we assume their prices are unaffected by tariffs and impose the restriction $\hat{p}_{gk}$=1 for all g and k. The expenditure shares b_{hgkt0} and b_{hgt0} are directly obtained from the 2004 CSES data.

It is difficult to estimate the elasticities of substitution with our data. The reason is that we need to track households over time to observe expenditure switching across goods and origins, but the CSES data are repeated cross-section data. Given the high uncertainty regarding the values of σ and ρ, we treat them as free parameters and examine how the results change with varying values of the elasticities. Specifically, we experiment with different values with $\sigma \in \{2,4,8,10\}$ and $\rho \in \{4,8,16,20\}$. Since substitution within goods should be larger than across goods, we impose the restriction that $\rho > \sigma$ when setting the parameter values.

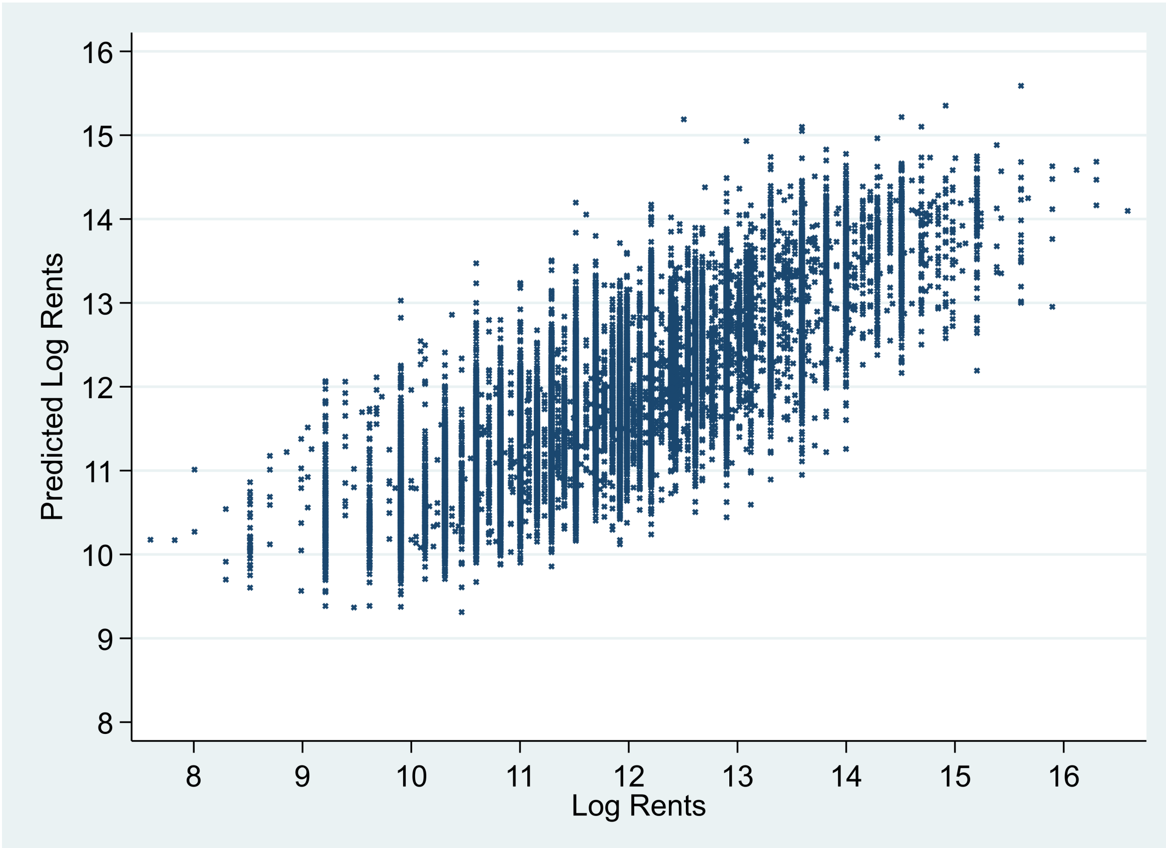
Appendix Figures and Tables

Figure A1: Cambodia's Tariff Rates during 2002-2019



Notes: MFN is applied MFN tariffs, ANZ indicates the ASEAN-Australia-New Zealand FTA, China indicates the ASEAN-China FTA, ASEAN indicates the ASEAN Free Trade Area, India indicates the ASEAN-India FTA, Japan indicates the ASEAN-Japan Comprehensive Economic Partnership, Korea indicates the ASEAN-Republic of Korea FTA.
Source: The WTO's Tariff Download Facility and FTA documents.

Figure A2: Scatter Plot of Predicted and Actual Rents



Notes: Horizontal axis is actual log rents. Vertical axis is the predicted log rents based on the regression result of Appendix Table C1.

Table A1: Summary of Diary Data

Variable	2004	2009	2014	2019/20
No. of households	11,993	11,971	12,092	10,075
No. of transactions	2,143,148	2,359,869	1,194,325	475,397
Agricultural goods	1,704,639	1,857,255	954,414	357,234
Manufacture goods	227,248	275,368	74,039	29,863
Services	211,261	227,246	165,872	88,300
Per-household transactions	178.7	197.1	98.8	47.2
Agricultural goods	142.1	155.1	78.9	35.5
Manufacture goods	18.9	23.0	6.1	3.0
Services	17.6	19.0	13.7	8.8
Per-household items	39.7	47.1	35.7	25.0
Agricultural goods	32.3	39.8	30.5	20.5
Manufacture goods	4.3	4.0	2.3	1.6
Services	3.1	3.3	3.0	2.8
Per-household import items	5.1	5.7	3.8	2.8
Agricultural goods	2.7	3.6	2.2	1.6
Manufacture goods	2.4	2.0	1.5	1.2
Services	0.1	0.1	0.1	0.1

Source: Authors' calculation using CSES in 2004, 2009, 2014, and 2019/20.

Table A2: Regression Result of Housing Rents

	Coef.	Std. Err.
Log floor area	0.529***	(0.0687)
Log floor area squared	0.00211	(0.00930)
No. of rooms	0.186***	(0.0122)
No. of rooms squared	-0.00770***	(0.00203)
Publicly provided electricity	0.147***	(0.00945)
Piped in dwelling	0.190***	(0.0131)
Wall-material fixed effects	Yes	
Roof-material fixed effects	Yes	
Floor-material fixed effects	Yes	
Year fixed effects	Yes	
District fixed effects	Yes	
No. of observations	34,139	
R-squared	0.662	
Mean of log rents	11.72	

*Notes: Sample years include 2004, 2009, 2014, and 2019/20; monthly housing rents are measured by the value of rents for rented housing or the estimated value of rents of a similar housing for house owners; wall materials are (1) bamboo, thatch/leaves, grass, (2) wood or logs, (3) plywood, (4) concrete, brick, stone, (5) galvanized iron, aluminum or other metal sheets, (6) fibrous cement/asbestos, (7) makeshift, mixed materials, (8) others; roof materials are (1) thatch/leaves/grass, (2) tiles, (3) fibrous cement, (4) galvanized iron, aluminum, or other metal sheets, (5) salvaged materials, (6) mixed but predominantly made of galvanized iron/aluminum, tiles or fibrous cement, (7) mixed but predominantly made of thatch/leave/grass or salvaged materials, (8) concrete, (9) plastic sheet, (10) others; floor materials are (1) earth, clay (2) wooden planks, bamboo strips, (3) cement/brick/stone, (4) parquet, polished wood, (5) polished stone, marble, (6) vinyl, (7) ceramic tiles, (8) others; we report robust standard errors; constant is not reported; ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.*

Table A3: Summary of Weighted-Average Tariff Rates

	2004	2009	2014	2019
No. of tariff lines	1,187	1,200	1,200	1,200
Weighted Average of MFN Rates (%)				
Mean	16.3	11.7	10.7	10.3
Std. Dev.	12.4	9.9	8.9	8.5
Weighted Average of Lowest Tariff Rates (%)				
Mean	15.6	8.9	5.6	3.3
Std. Dev.	12.0	6.9	4.7	4.3
Mean by product (%)				
Agriculture (HS01-15)	14.8	8.7	6.6	3.2
Processed Foods (HS16-24)	26.2	13.6	8.2	6.0
Mineral (HS25-27)	8.9	4.9	3.4	1.3
Chemicals (HS28-40)	11.1	7.1	5.1	2.7
Leather/Wood/Pulp (HS41-49)	18.2	8.4	5.8	3.7
Textile/Apparel/Footwear (HS50-67)	20.1	9.3	4.0	2.7
Stone/Metal (HS68-83)	13.7	7.0	4.6	2.2
Machinery/Mechanicals (HS84-85)	16.0	12.0	6.8	4.5
Transport Equipment (HS86-89)	14.6	11.2	7.1	4.5
Miscellaneous Goods (HS90-97)	18.4	12.1	8.3	6.0

Notes: Tariff rates are based on the HS 2007 nomenclature at the 4-digit level.
Source: Authors' calculation using MFN tariffs in WTO and preferential tariffs in Cambodia's FTAs.

Table A4: Robustness Checks of Tariff Pass-through Rates

Dep var.: $Ln(Price_{hgkt})$	(1)	(2)	(3)	(4)	(5)	(6)
$ln(1+tariff)_{gt}$	0.378**	0.335*	0.347*	0.317*	0.255	0.231
	(0.192)	(0.190)	(0.190)	(0.189)	(0.193)	(0.193)
$ln(1+tariff)_{gt} \times Import_k$		0.308***		0.303***		0.262***
		(0.101)		(0.101)		(0.0993)
$ln(WorldPrice)_{gt}$	0.0165	0.0114	0.0115	0.0110	0.0108	0.0103
	(0.0151)	(0.0152)	(0.0152)	(0.0153)	(0.0153)	(0.0153)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Product-unit fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Province-origin-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Payment fixed effects			Yes	Yes		
Purpose fixed effects			Yes	Yes		
Winsorizing	Yes	Yes				
Observations	1,545,696	1,545,776	1,588,080	1,588,080	1,486,824	1,486,824
R-squared	0.943	0.943	0.940	0.940	0.944	0.944
p-values for H0: $\beta_1 + \beta_2 = 0$		0.022		0.032		0.021

*Notes: The sample includes domestically produced and imported goods. Columns (1) and (2) winsorize the price at 1% level. Columns (3) and (4) additionally include payment fixed effects and expenditure purpose fixed effects. Columns (5) and (6) restrict the sample to transactions with cash payment and consumption purposes. Parentheses report standard errors clustered by goods-province pairs. Constant is not reported. Each observation is weighted by sampling weights. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.*

Table A5: List of Goods with Top and Bottom Import Intensities

Panel A: Agricultural Goods			
Goods	Import Intensity(%)	Goods	Import Intensity(%)
Whole grain maize	97.4	Rice	0.25
Baby Milk Powder	86.9	Pork without fat	0.25
Monosodium glutamate (MSG)	86.2	Peanut Preparation	0.24
Onions/shallot	78.4	Sugar cane	0.20
Other cooking oils	77.2	Other rice	0.15
Durian	77.2	Fermented/salted eggs	0.13
Other processed milk	77.0	Red pepper spice	0.13
Rice bran oil	72.4	Smoked fish	0.07
Condensed milk	71.8	Green dhall	0.05
Yellow noodles	70.5	Other locally processed meat	0.00
Panel B: Manufactured Goods			
Goods	Import Intensity (%)	Goods	Import Intensity (%)
Gasoline	100	Other jewelry, clocks and watches	36.3
Diesel fuel	100	Oil charges	35.3
Motor scooter	100	Cutlery	33.9
Car	100	Other solid fuels	10.1
Motor oil	100	Textbooks for education	6.9
Other fuels and lubricants for personal transport equipment	100	Pets and related products	4.7
Small electric accessories	99.4	Non-prescription drugs (traditional)	4.2
Men's and boys' leather shoes	99.0	Electricity	3.1
Beauty products	96.3	Newspapers and periodicals	0.3
Materials for making or repair of clothing	91.0	Firewood	0.1
Women's and girls' other outdoor clothing	88.9	Charcoal	0.1

Notes: We drop the goods with less than 100 observations in the diary data for 2004.

Table A6: The Relationship between Welfare Changes and Income

	(1)	(2)	(3)	(4)
Dependent variable	W1	W2	W3	W4
Income percentile 10-20	0.020	0.039	0.031	0.068
	(0.034)	(0.058)	(0.046)	(0.048)
Income percentile 20-30	0.16***	0.10*	0.24***	0.31***
	(0.036)	(0.058)	(0.047)	(0.051)
Income percentile 30-40	0.14***	0.10*	0.23***	0.29***
	(0.037)	(0.059)	(0.047)	(0.051)
Income percentile 40-50	0.15***	0.095	0.34***	0.42***
	(0.038)	(0.059)	(0.048)	(0.052)
Income percentile 50-60	0.19***	0.074	0.46***	0.59***
	(0.040)	(0.058)	(0.049)	(0.056)
Income percentile 60-70	0.18***	0.088	0.53***	0.66***
	(0.044)	(0.058)	(0.051)	(0.058)
Income percentile 70-80	0.18***	0.19***	0.62***	0.81***
	(0.049)	(0.059)	(0.056)	(0.064)
Income percentile 80-90	0.18***	0.23***	0.74***	0.99***
	(0.055)	(0.060)	(0.060)	(0.071)
Income percentile 90-100	-0.21***	0.23***	0.49***	0.80***
	(0.063)	(0.062)	(0.067)	(0.079)
Province fixed effects	Yes	Yes	Yes	Yes
No. of observations	11,909	11,909	11,909	11,909
R-squared	0.0088	0.0025	0.026	0.035

*Notes: The dependent variable is consumer welfare changes in percentage points. W1, W2, W3, and W4 represent the corresponding welfare measures with different assumptions on the availability of the origin information. W1: origin is totally unknown; W2: home-produced goods are distinguished from other origins and excluded from total expenditure; W3: home-produced goods are distinguished from other origins and included in total expenditure. W4: All origins are distinguished. See detailed descriptions in section 5.2. Parentheses report standard errors; constant is not reported. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.*

Table A7: Exact Approach of Consumer Gains from Trade Liberalization

	(1)	(2)	(3)	(4)	(5)
σ	2	4	8	10	First-order
ρ	4	8	16	20	approach
0-10	2.57	2.70	3.01	3.19	2.51
10-20	2.64	2.78	3.09	3.28	2.58
20-30	2.89	3.03	3.34	3.52	2.82
30-40	2.87	3.01	3.33	3.51	2.80
40-50	3.00	3.15	3.47	3.65	2.93
50-60	3.17	3.32	3.65	3.83	3.10
60-70	3.24	3.38	3.70	3.88	3.17
70-80	3.39	3.53	3.84	4.02	3.32
80-90	3.57	3.72	4.03	4.20	3.50
90-100	3.37	3.51	3.80	3.96	3.31
All	3.07	3.21	3.53	3.70	3.00
90-100 pct/0-10 pct	1.31	1.3	1.26	1.24	1.32
80-90 pct/10-20 pct	1.35	1.34	1.3	1.28	1.36

Notes: This table reports the percentage change in cost-of-living from import tariff reductions between 2004 and 2019, which is estimated under a nested non-homothetic CES demand system as in Auer et al. (2024). Implementation details are described in Appendix E. Columns (1)-(4) set different values for the elasticity of substitution across goods, σ, and elasticity of substitution across origins, ρ. Column (5) reports gains estimated with the first-order approach for comparison. Consumer gains for all households and for each income decile are reported. The last two rows report the ratio of consumer gains between the 90-100 income percentile and 0-10 percentile, and the ratio between 80-90 percentile and 10-20 percentile, respectively.