Consumer Heterogeneity, Free Trade, and the Welfare Impact of Income Redistribution

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Abstract

Demographic differences, like young and elderly, and healthy and disabled, are summarized as consumers' heterogeneity in expenditure shares, and introduced into an otherwise standard HO model, together with income distribution in this paper. We prove that free trade may hurt consumers who spend more on the exporting good if the volume of trade is small, while redistributing more income to consumers who spend more on the exporting good may make everyone in the country better off. By contrast, redistributing more income to consumers who spend more on the importing good may make everyone in the country worse off.

Keywords: Consumers' Heterogeneity, Heckscher-Ohlin Model, Income Distribution, Welfare

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Contents

1 Introduction

Rising income inequality over the past two decades poses one of the greatest challengers in most of countries. At the same time, world trade, as share of world GDP, has risen from 36 percent to 55 percent since 1980.[1] Fighting against income inequality has become a ma3py(s)3.3(er)50.5(p)-20.4()5.4icceymesa sme d(ece)4.3(v)23(elopising)-250.c(s)-1.1un(v)23 innests3(,)47o5961(o)4339.7(io)4395.is10ein(in)4330.5(the)4530.tlerahe5inovt effect of income redistribution can be decomposed into two components: the **wealth effect** (direct effect, more (less) income makes consumers better (worse) off), and an indirect effect – the **terms of trade effect.** For example, if more income is redistributed to group 1 consumers, who spend more on the exporting goods, this will raise the price of the exporting goods but lower the price of the importing goods, and therefore will improve the **terms of trade.** An improvement in the terms of trade increases the real GNP of the country and decreases the relative price of the importing good, both of which benefit consumers in group 2. If the **terms of trade effect** is sufficiently strong and dominates the **wealth effect,** then group 2 consumers will be better off after the income redistribution. If the volume of trade is sufficiently large, the **terms of trade effect** will also benefit consumers in group 1 so their welfare is improved as well. On the other hand, the same mechanism implies that if the **terms of trade effect** is sufficiently strong and the volume of trade is sufficiently large, redistributing more income to consumers who spend more on the importing goods will make consumers in both groups worse off.

We note that such an **Pareto improvement** income redistribution only happens in an open economy. In a closed economy, when more income is redistributed to group 1 consumers, the **wealth effect** and the **terms of trade effect** are always in opposite signs. It is possible that the **terms of trade effect** may dominate the **wealth effect,** so that the consumers in group 2 may be better off even if their income share is reduced. However, if that happens in a closed economy, the consumers in group 1 must be worse off. In a open economy, on the other hand, if the country exports a sufficiently large amount of good 1, the **terms of trade** effect can be beneficial to consumers in group 1 as well. So consumers' welfare in both groups can be improved after the income redistribution.

Our paper is related to the theoretical literature of nonhomothetic preferences and international trade. Nonhomothetic preferences were first introduced by Linder (1961), who used the demand-side considerations to explain the large volume of intra-industry trade between developed countries. Markusan (1986) combines nonhomothetic preferences with scale economies and differences in endowments in explaining the volume of trade. Flam and Helpman (1987), Stokey (1991), and Matsuyama (2000) introduce nonhomothetic preferences into Ricardian models with a continuum of goods. Mitra and Trindade (2004) focus on the role of inequality in the determination of trade flows and patterns, while Dutt and Mitra (2005) consider ideology and inequality within HO framework. Fieler (2007) introduces nonhomothetic preferences into Eaton-Kortum model to explain the positive relationship between trade share and income per capita. Fajgelbaum, Grossman, and Helpman (2009) use a model to generate nested logit demand structures and study trade in horizontally and vertically differentiated products. The **terms of trade effect** is one of the driving forces for nontrivial effects in this literature, as well as in our paper. Matsuyama (2000) notices that South's domestic policy to redistribute income from rich, who buy foreign imports, to the poor, who cannot afford to buy them, may make all households in South better off. However, there is a fundamental difference between this paper and the existing literature. In Matsuyama (2000), the result relies on the income effect that makes luxury goods complement to necessary goods. The Cobb-Douglas utility function assumed in this paper implies that two goods are neither substitute nor complement. Our result relies on the assumption that the country exports sufficiently large amount of good 1 so the terms of trade effect also benefits consumers in group 1. Given that the world trade, as share of world GDP, has risen from 36 percent to 55 since 1980, our result provides a practical policy guidance to redistribute the income in emerging economies. Furthermore, the opposite result in our paper that redistributing income to consumers who spend more on the importing goods may make everyone worse off is not presented in Matsuyama (2000).

Models of nonhomothetic preferences which assume that wealthier people spend more on luxury goods can be viewed as a special case of our model. We depart from the connection between the income level and the expenditure share, and the focus of income elasticities in this literature, but formulate a more general and a much simpler framework for issues related to demographic differences across consumers. In our view, differences in expenditure shares catch an essential heterogeneity in different demographic groups, and therefore provide a channel to study the interaction between international trade and demographic differences, which has been largely left aside in the literature.

Our result that free trade may make the consumer who spends more on the exporting good worse off provides an alternative channel for conflict interests in free trade, different from traditional Stopler-Samuelson explanation in conflict of interests between labor and capital. We actually prove a more general result: for a particular good as long as the ratio of the consumers' expenditure share in a group to the average expenditure share in a country is larger than the ratio of the country's output to the consumption, then a policy resulting in an increase in the relative price of the good will hurt the consumers in that group. The present model, therefore, will be appropriate to address issues of political support among different demographic groups.

The rest of the paper is organized as follows. Section 2 develops the basic model. A general equilibrium analysis is conducted in Section 3. Trade patterns and the welfare effect of free trade are discussed in Section 4, while the welfare impact of income redistribution is discussed in Section 5. Section 6 then concludes.

2 The Model

In an otherwise standard two goods, two factors, and two countries Heckscher-Ohlin framework, we introduce income distribution and the consumers' heterogeneity in expenditure shares into the model. Focusing now on a single country, let the labor endowment (population) be and the capital endowment be in the country.

There are two groups of consumers. The size of group ($= 1\ 2$) is $_h$ where $_1 + \ _2 = 1$ and $0 \ -\ _h \quad 1$ The utility function for consumers in group is $_h(\ _{h1}\ \ _{h2}) = \ ^{a_h}_{h1}\ ^{1\ \ a_h}_{h2}$ where $_h$ is the consumer's expenditure share of good 1 in group . We assume that $_1 \quad _2$ so that a consumer in group 1 spends more on good 1 than a consumer in group 2. The income share of group is denoted as $_h$ where $_1 + \ _2 = 1$ The aggregate income in the country is denoted by, $= \quad +$ where and are the wage rate and the rental rate, respectively. Therefore, the individual consumer's income in group $_h$ is given by

$$_h = \frac{\ _h}{\ _h} \tag{1}$$

If $_h = \ _h$ the income distribution exhibits a perfect equality.

Let $_i$ be the price of good The consumer's utility maximization problem in group is

$$\begin{aligned} \max \quad _h(\ _{h1}\ \ _{h2}) &= \ ^{a_h}_{h1}\ ^{1\ \ a_h}_{h2} \\ \text{s.t.} \quad _1\ _{h1} + \ _2\ _{h2} &= \ _h \end{aligned} \tag{2}$$

which solves for the individual demand of good in group :

$$_{h1} = \frac{\ _h\ _h}{\ _1} \text{ and } \ _{h2} = \frac{(1 \quad _h)\ _h}{\ _2} \tag{3}$$

Therefore, the total demands for goods 1 and 2 are:

$$_1 = (\ _1\ _{11} + \ _2\ _{21}) = \frac{\ _1}{\ _1} \tag{4}$$

$$_2 = (\ _1\ _{12} + \ _2\ _{22}) = \frac{\ _2}{\ _2} \tag{5}$$

where

$$_1 \quad = \qquad {}_1 \ {}_1 + (1 \qquad {}_1) \ {}_2 \tag{6}$$

$$_2 \quad = \qquad {}_1 (1 \qquad {}_1) + (1 \qquad {}_1) (1 \qquad {}_2) = 1 \qquad {}_1 \tag{7}$$

are average expenditure shares of goods 1 and 2 in the country, respectively. Since $_1 \qquad _2$, it is immediately seen that a rise in $_1$ raises $_1$ but lowers $_2$. If more income is distributed to consumers who spend more on good 1 the total demand for good 1 increases, while the total demand for good 2 declines.

3 The Equilibrium Analysis

The market is perfectly competitive. The technology exhibits constant returns to scale. The first set of equilibrium conditions for the two-by-two economy is given by zero profit conditions:

$$_1 = {}_1(\qquad) \text{ and } {}_2 = {}_2(\qquad) \tag{8}$$

where $_i(\qquad)(\; = 1 \; 2)$ is the unit cost function.

Let $_i$ be the output of sector The second set of equilibrium conditions is full employment for both factors:

$$_{1L} \ {}_1 + \ {}_{2L} \ {}_2 \quad = \tag{9}$$

$$_{1K} \ {}_1 + \ {}_{2K} \ {}_2 \quad = \tag{10}$$

where $_{iL} = \frac{\partial c_i}{\partial w}$ is the labor used to produce one unit of good , and likewise for $_{iK}$

The third set of equilibrium conditions is that the product market clears and can be written as:

$$\frac{_1}{_2} = \frac{_1}{_2} = \frac{_2 \quad _1}{_1 (1 \qquad _1)} \tag{11}$$

All these conditions are standard except that the relative demand $_1 \quad _2$ now depends on the parameter of income distribution, $_1$ and the parameter of expenditure share in each group, $_h$ other than relative price $_1 \quad _2$

Suppose sector 1 is labor intensive. That is, $_{1L} \quad _{1K} \qquad _{2L} \quad _{2K}$ The classical **Rybczynski effect** still holds: an increase in capital-labor ratio $=$ reduces the relative supply of labor intensive good with respect to the capital intensive good, $_1 \quad _2$ and therefore increases the relative price, $_1 \quad _2$ As we have formally proved in the Appendix, the **income distribution effect** now also plays a role in determining equilibrium output levels and prices. As $_1$ increases, more income is distributed to consumers who spend more on labor intensive good, good 1, and this increases the relative demand for the labor intensive good with respect to the capital intensive good, $_1 \quad _2$ and therefore increases $_1 \quad _2$ Consider a case that the country is capital abundant but rich people spends more on capital intensive good, i.e., is large and $_1$ is small. The larger increases the relative price of labor intensive good, $_1 \quad _2$ but the smaller $_1$ reduces it. The pattern of production and trade, therefore, is jointly determined by both the **Rybczynski effect** and the **income distribution effect.**

Let $\hat{} =$ denote the percentage change of variable Rewrite the equation (37) in the Appendix here

$$\Phi (\hat{}_1 \quad \hat{}_2) = \hat{} + \quad \hat{}_1 \tag{12}$$

where $\Phi = | \; | + (\; _L + \; _K) \; | \; | \quad 0$ and $= | \; | \quad 0$ Two extreme cases worth noting: if $\hat{}_1 = 0$ the increase in increases $_1 \quad _2$; if $\hat{} = 0$ on the other hand, the increase in $_1$ increases $_1 \quad _2$ We summarize our results as follows:

Proposition 1 Ceteris paribus, an increase in total capital-labor ratio reduces relative output and increases relative price of the labor intensive good, while distributing more income to people who spends more on the labor intensive good increases both relative output and relative price of the labor intensive good.

4 Free Trade

We now turn to the equilibrium of free trade between the home country and the foreign country. Variables in the foreign country are denoted by superscript "*". Let good 2 be the numeraire good so that $\ _2$ is normalized as 1 Let $\ ^T$ be the relative price in free trade equilibrium. All equilibrium conditions derived in the last section still hold except that the domestic market clearing condition (11) needs to be replaced by the world market clearing condition

$$\frac{1}{\ ^T(1 \qquad \ _1)} \qquad \frac{1}{\ _2} = \ ^*(\ ^T) \tag{13}$$

where $\ ^*(\ ^T)$ is the relative supply of exports from the foreign country. If $\ ^*(\ ^T)$ 0 home imports good 1 and exports good 2. If $\ ^*(\ ^T) \quad 0$ we have the opposite. We will first discuss trade patterns and then examine the welfare impact of free trade.

4.1 Trade Patterns

Heckscher-Ohlin theorem provides a supply side driver for free trade. The difference in income distribution across countries in our model, on the other hand, provides a demand side driver for free trade. First consider the home and foreign countries have the same capital-labor endowment ratio, i.e., $\frac{K}{L} = \frac{K^*}{L^*}$ However, $\ _1 \qquad \ ^*_1$ Using Proposition 1, we immediately see that $\ ^a \qquad \ ^{a*}$ Hence, in autarky the relative price of good 1 is lower in the country where smaller income is distributed to consumers who spend more on good 1. It must be the case that $\ ^a \qquad \ ^T \qquad \ ^{a*}$ In free trade equilibrium the home country exports good 1 and imports good 2

In general when $_1 \neq$ and $\frac{K}{L} \neq \frac{K^*}{L^*}$ applying Proposition 1, the trade patterns of the home country are summarized in four cases as follows:

	$\frac{K}{L}$ $\frac{K^*}{L^*}$	$\frac{K}{L}$ $\frac{K^*}{L^*}$
$_1$ $^*_1$	I: exporting good 1	II: undetermined
$_1$ $^*_1$	III: undetermined	IV: exporting good 2

When a country is labor (capital) abundant and its income share for consumers who spend more on the labor intensive good is smaller (larger), both the Rybczynski effect and the income distribution effect move in the same directions, and the country exports the labor (capital) intensive good 1 (good 2). These are cases I and IV. When the Rybczynski effect and the income distribution effect move in the opposite directions, which are the cases II and III, the trade patterns are undetermined.

Note that the results above provide a possible demand side explanation why the classical Heckscher-Ohlin theorem fails empirically. A relatively poor country (labor abundant) may have a larger proportion of poor people who spend more on the labor intensive good. Thus, the supply side and demand side drivers may move in opposite directions. As Debaere (2003) shows, however, once the difference in factor endowments between two countries is large, the supply side effect dominates and the HO theorem fits well with the data.

4.2 Welfare

In classical HO model, consumers are all better off in free trade than in autarky. It is interesting to investigate if that result still holds when consumers are heterogeneous. In particular, though specialization in production is still beneficial, the consumer who spends more on the exporting good now suffers more from the increase in the relative price. We will first examine the effect of an increase in relative price of good 1 (due to the change in world market) on consumer's welfare in different groups, and then illustrate why free trade may hurt some consumers in the country.

The function for domes...

$$( ) = \max \{ ( ) \} \quad \text{are feasible} \qquad (14)$$

In this case, ... and by the envelope theorem ... group. That is,

$$h(h) = \max\{(1\ h) + h\} \qquad (15)$$

Using the envelope th...

$$\frac{h}{h}(h) = \frac{1}{h}\ h \qquad (16)$$

where h is the marginal util...

$$h = \frac{1}{h}\ h \qquad (17)$$

Now substituting (17...

$$\frac{h}{h}(h) = \frac{1}{h}\ \frac{1}{1}\ h \qquad (18)$$

The expression we ju...

Proposition 2 For a particular go... share in a group to th... of the country's outpu... increase in the relativ...

If the home country ... exports goods ...

in on both groups are summarized in the following table:

$\frac{y_1}{X_1}$ $\frac{a_2}{A_1}$	$\frac{a_2}{A_1}$ $\frac{y_1}{X_1}$ 1	1 $\frac{y_1}{X_1}$ $\frac{a_1}{A_1}$	$\frac{a_1}{A_1}$ $\frac{y_1}{X_1}$
$\frac{dV_1}{dp}$ 0	$\frac{dV_1}{dp}$ 0	$\frac{dV_1}{dp}$ 0	$\frac{dV_1}{dp}$ 0
$\frac{dV_2}{dp}$ 0	$\frac{dV_2}{dp}$ 0	$\frac{dV_2}{dp}$ 0	$\frac{dV_2}{dp}$ 0

When increases, the consumer gets hurt from the price increase in good 1, but benefits from the price decrease in good 2. When $\frac{a_2}{A_1}$ $\frac{y_1}{X_1}$ $\frac{a_1}{A_1}$, and in particular, when $\frac{y_1}{X_1} = 1$ in autarky, there is a conflict in the interests: the consumer who spends more on good 1 sees a reduction in welfare, while the consumer who spends more on good 2 is better off. If the country imports a large amount of good 1 ($\frac{y_1}{X_1}$ $\frac{a_2}{A_1}$), the rise in the relative price of the import good hurts both groups of consumers. On the other hand, if the country exports a large amount of good 1 ($\frac{a_1}{A_1}$ $\frac{y_1}{X_1}$), the increase in the relative price of the export good benefits all consumers.

Consider a country moving from autarky to free trade and exporting good 1, so the relative price of good 1, increases and 1 $\frac{y_1}{X_1}$ That is represented by columns 3 and 4 in the above table. Free trade always benefits consumers in group 2 who spend more on the import good. If the amount of exports is small (1 $\frac{y_1}{X_1}$ $\frac{a_1}{A_1}$), however, free trade will reduce welfare of the consumer who spends more on the exporting good.

In Figure 1 we modify the classical diagram of the gains from trade to explain why free trade may hurt the consumer in group 1. The home country both produces and consumes at point $_2$ in autarky. In free trade the home country produces at but consumes at . It exports good 1 and imports good 2. $_1$ $_2$ is the Edgeworth box in autarky. is the middle point of $_1$ $_2$ so that income is equally distributed between consumer 1 and consumer 2. The contract curve is represented by $_1$ $_2$ Consumer 1 consumes bundle where her indifference curve is tangent to the budget line. In free trade, the Edgeworth box is represented by $_1$ $'$ $'$ Now $'$ is the middle point in the line of $_1$. The relative price of good 1, is higher in free trade than in autarky. The terms of trade in free trade is represented by line (and $'$) The contract curve in free trade is $_1$ Consumer 1 in free trade consumes bundle where the budget line $'$ is tangent to the indifference curve. It is immediately seen that consumer 1 is worse off in free trade than in autarky, due to the **terms of trade effect.**

5 The Welfare Impact of Income Redistribution

Redistributing more income to a consumer in group increases her utility at given prices, which is denoted as the **wealth effect.** On the other hand, redistributing more income to the consumer who spends more on good increases the price of good but decreases the price of good which is denoted as the **terms of trade effect.** The **the terms of effect** may reduce or increase consumer 's utility. Applying the envelope theorem to (15) gives

$$\frac{{}_h(\quad {}_h)}{{}_h \quad {}_h} = \frac{(\ )}{{}_h} + \left(\frac{{}_h \ {}_1}{{}_h} \qquad {}_{h1}\right)\frac{\quad}{{}_h} \tag{19}$$

The first term on the right hand side of equation (19) catches the **wealth effect,** which is positive. The second term on the right hand side of equation (19) catches the **terms of trade effect,** which could be negative.

We consider a policy that increases $_1$ From equation (13), an increase in $_1$ raises the world relative demand for good 1 and therefore increases That is, $\frac{\partial p}{\partial \sigma_1}$ 0 Substituting (17) into (19) and noting that $_2 =$ $_1$, we have

$$\frac{{}_1(\quad {}_1)}{{}_1 \quad {}_1} = \frac{(\ )}{{}_1} + \frac{{}_1 \ {}_1}{{}_1}\left(\frac{{}_1}{{}_1} \qquad \frac{{}_1}{{}_1}\right)\frac{\quad}{{}_1} \tag{20}$$

and

$$\frac{{}_2(\quad {}_1)}{{}_2 \quad {}_1} = \frac{(\ )}{{}_2} + \frac{(1 \qquad {}_1) \ {}_1}{{}_2}\left(\frac{{}_1}{{}_1} \qquad \frac{{}_2}{{}_1}\right)\frac{\quad}{{}_1} \tag{21}$$

We consider three intervals of $\frac{y_1}{X_1}$:

Interval 1, $0 \quad \frac{y_1}{X_1} \quad {}_2 \quad {}_1$: The home country imports good 1. The terms of trade e*ff*ects for consumers in both groups are negative. Thus, we must have ${}_2 \quad {}_1 \quad 0$ in this case. Noting that the total expenditure on good 1 in the country, ${}_1 \; (\;) = \quad {}_1$ with some computations we obtain that ${}_1 \quad {}_1 \quad 0$ if and only if $\frac{\widehat{p}}{\widehat{\sigma}_1}$ where

$$= \frac{1}{{}_1 \left(\frac{a_1}{A_1} \quad \frac{y_1}{X_1} \right)} \tag{22}$$

Interval 2, ${}_2 \quad {}_1 \quad \frac{y_1}{X_1} \quad {}_1 \quad {}_1$: The home country imports good 1 if $\frac{y_1}{X_1} \quad 1$ but exports it if $\frac{y_1}{X_1} \quad 1$. The terms of trade e*ff*ect is negative for Group 1, but positive for Group 2 Again, ${}_1 \quad {}_1 \quad 0$ if and only if $\frac{\widehat{p}}{\widehat{\sigma}_1}$ Now ${}_2 \quad {}_1 \quad 0$ if and only if $\frac{\widehat{p}}{\widehat{\sigma}_1}$ where

$$= \frac{1}{(1 \quad {}_1) \quad {}_1 \left(\frac{y_1}{X_1} \quad \frac{a_2}{A_1} \right)} \tag{23}$$

and we can show that if $\frac{y_1}{X_1} \quad \frac{a_2}{A_1}$.

Interval 3, ${}_1 \quad {}_1 \quad \frac{y_1}{X_1}$: The home country exports good 1 Now, the terms of trade e*ff*ect is positive for consumers in both groups. Thus, ${}_1 \quad {}_1$ must be positive, as both the wealth e*ff*ect and the terms of trade e*ff*ect are positive for consumers in group 1. For consumers in group 2, ${}_2 \quad {}_1 \quad 0$ if and only if $\frac{\widehat{p}}{\widehat{\sigma}_1}$

Our results are summarized in the following table:[3]

	$\frac{\widehat{p}}{\widehat{\sigma}_1}$	$\frac{\widehat{p}}{\widehat{\sigma}_1}$	$\frac{\widehat{p}}{\widehat{\sigma}_1}$
$0 \quad \frac{y_1}{X_1} \quad\quad 2 \quad 1$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$
$2 \quad 1 \quad \frac{y_1}{X_1} \quad\quad 1 \quad 1$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$
$1 \quad 1 \quad \frac{y_1}{X_1}$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$	$1 \quad 1 \quad 0$ $2 \quad 1 \quad 0$

In autarky where $\frac{y_1}{X_1} = 1$ we must have $=$ It is a special case of Interval 2 ($2 \quad 1 \quad \frac{y_1}{X_1} \quad 1 \quad 1$) Redistributing more income to Group 1 must benefit one group but hurt another. Therefore, such a policy can not be Pareto improvement in a closed economy. It is interesting to note that Group 1 may be worse off. If the terms of trade effect is sufficiently strong ($\frac{\widehat{p}}{\widehat{\sigma}_1}$) the group whose income is increased will be worse off, and the group whose income is reduced will be better off.

In an open economy, if the terms of trade effect is sufficiently strong ($\frac{\widehat{p}}{\widehat{\sigma}_1}$) and the volume of trade is sufficiently large ($\frac{y_1}{X_1} \quad 2 \quad 1$ or $\frac{y_1}{X_1} \quad 1 \quad 1$) redistributing more income to consumers who spend more on the importing good reduces welfare for all consumers. However, redistributing more income to consumers who spend more on the exporting good makes a Pareto improvement for all consumers in the country.

When the volume of trade is small ($2 \quad 1 \quad \frac{y_1}{X_1} \quad 1 \quad 1$) and the level of the terms of trade effect is intermediate ($\frac{\widehat{p}}{\widehat{\sigma}_1}$), the income redistribution makes consumers in both groups worse off, but for different reasons. The terms of trade effect dominates the for consumers in group 2.

We note that an income redistribution policy can be Pareto improvement only in an open economy. It is possible that the terms of trade effect may dominate the wealth effect, so that the consumers in group 2 may be better off even if their income share is reduced. However, if that happens in a closed economy, the consumers in group 1 must be worse off even if their income share is increased. In an open economy, however, as the country exports a large amount of good 1, the terms of trade effect can be beneficial to consumers in group 1 as well. So consumers' welfare in both groups can be improved. Summarizing we have:

Proposition 3 In an open economy, if a country's volume of trade is sufficiently large, and the terms of trade effect is sufficiently strong, then redistributing more income to consumers who spend more on the exporting good makes a Pareto improvement for all consumers in the country. By contrast, redistributing more income to consumers who spend more on the importing good hurts everyone in the country.

It is expected that the consumer is better off when her income share is increased. However, it is interesting to note that the consumer could be also better off even if her income share is reduced. We use Figure 2 to further illustrate why that may happen.[4] Let the income distribution be perfectly equal before income redistribution takes place. The country produces at point but consumes at point $_2$ so that it exports good 2 and imports good 1. $_1$ $_2$ is the Edgeworth box before the income redistribution. is the middle point of $_1$ $_2$ so that income is equally distributed between consumer 1 and consumer 2. The contract curve is represented by $_1$ $_2$ Consumer 1 consumes bundle where her indifference curve is tangent to the budget line. Consider a policy to redistribute more income to the consumer who spends more on the exporting good, that is, to reduce the income share of consumer 1. The Edgeworth box after the income redistribution is represented by

[4]To draw the graph easily, we consider a reduction in σ_1, and assume that the home country exports good 2.

$_1$ $'$ $'$ Now $'$ is in the line of $_1$ indicating that consumer 1 has an income share smaller than 1 2 The relative price of the importing good, is lower now, and the new terms of trade is represented by line (and $'$) The new contract curve is $_1$ Consumer 1 now consumes bundle where the new budget line $'$ is tangent to the indifference curve. It can be immediately seen that consumer 1, whose income share is reduced, is better off, since the strong **terms of trade effect** dominates the **wealth effect.**

6 Conclusion

In this paper, demographic differences, like young and elderly, and healthy and disabled, are summarized as consumers' heterogeneity in expenditure shares, and introduced into an otherwise standard HO model, together with income distribution in this paper. We prove and provide precise conditions for two basic results: a policy resulting an increase in the relative price of a good may hurt consumers who spend more on the good, and redistributing more income to consumers who spend more on the exporting good may make everyone in the country better off. Our model only discusses two groups of consumers, but it can be easily extended to infinite groups of consumers with a continuum of expenditure shares. The median-voter can then be determined by her expenditure share, and that can provide a new framework for policy analysis.

In this static model, we do not discuss trade imbalances. However, the model can be extended to a dynamic setup. When income is redistributed to poor from rich, we would expect that the national savings rate will decline, as rich saves more, so that such an income redistribution policy may also reduce the current account surplus in emerging economies, like China. Therefore, redistributing more income from rich to poor in emerging economies, may 1) improve income inequality, 2) improve global imbalances, and 3) improve welfare for all consumers. It seems worthwhile to extend this model to a dynamic setup and study the issue of global imbalances together with income redistribution, which is left for the future research.

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7 Appendix

Proof of Proposition 1

The proof follows closely to the standard approach (Jones 1965). Totally differentiating

Substituting equations (26) and (31) into (27) and (28), we obtain:

$$
\begin{aligned}
{}_{1L}\widehat{\ }_{1} + {}_{2L}\widehat{\ }_{2} &= \widehat{\ } + \frac{{}_{L}}{|\ |}(\widehat{\ }_{1} \quad \widehat{\ }_{2}) && (32) \\
{}_{1K}\widehat{\ }_{1} + {}_{2K}\widehat{\ }_{2} &= \widehat{\ } \quad \frac{{}_{K}}{|\ |}(\widehat{\ }_{1} \quad \widehat{\ }_{2}) && (33)
\end{aligned}
$$

where ${}_{L} = {}_{1L}\ {}_{1r}\ {}_{1} + {}_{2L}\ {}_{2r}\ {}_{2}$ and ${}_{K} = {}_{1K}\ {}_{1w}\ {}_{1} + {}_{2K}\ {}_{2w}\ {}_{2}$

Taking log and differentiating the equation (11) give

$$
\widehat{\ }_{1} \quad \widehat{\ }_{2} = \widehat{\ }_{2} \quad \widehat{\ }_{1} + \ \widehat{\ }_{1} \qquad (34)
$$

where

$$
= \frac{(\ {}_{1} \quad {}_{2})\ {}_{1}}{[\ {}_{2} + (\ {}_{1} \quad {}_{2})\ {}_{1}]\,[1 \quad {}_{2} + (\ {}_{2} \quad {}_{1})\ {}_{1}]} \quad 0 \qquad (35)
$$

Now subtracting (32) from (33) and using (34), we have:

$$
\begin{aligned}
\left[|\ | + \frac{{}_{L} + {}_{K}}{|\ |}\right](\widehat{\ }_{1} \quad \widehat{\ }_{2}) &= \widehat{\ } + \frac{(\ {}_{L} + {}_{K})\ \widehat{\ }_{1}}{|\ |} && (36) \\
\left[|\ | + \frac{{}_{L} + {}_{K}}{|\ |}\right](\widehat{\ }_{1} \quad \widehat{\ }_{2}) &= \widehat{\ } + |\ |\ \widehat{\ }_{1} && (37)
\end{aligned}
$$

Thus, the increase in $=$ reduces relative equilibrium output ${}_{1}\ {}_{2}$ and increases the relative price ${}_{1}\ {}_{2}$ On the other hand, the increase in ${}_{1}$ increases relative equilibrium output ${}_{1}\ {}_{2}$ and increases the relative price ${}_{1}\ {}_{2}$

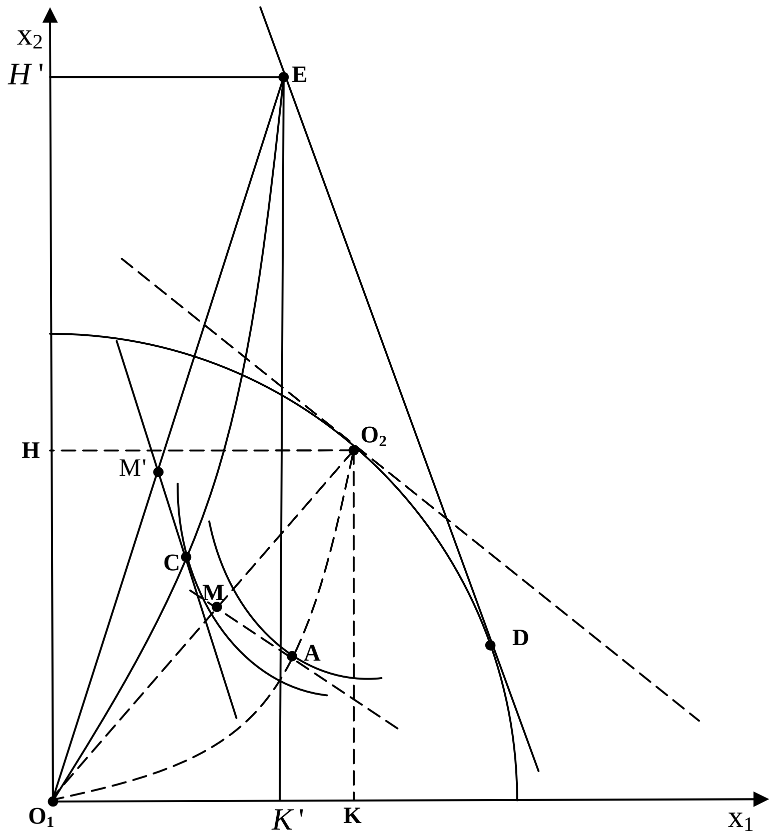

Figure 1

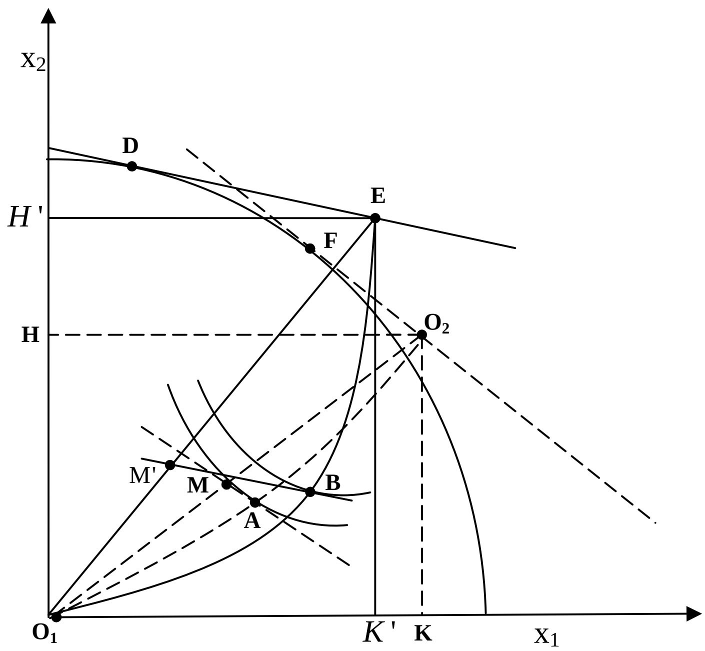

Figure 2