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The impact of income distribution on structural transformation: The role of extensive margin

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ABSTRACT

I study the impact of income distribution on structural transformation. Empirical results suggest that income inequality induces lower share of employment in services sector, and this negative effect gets stronger as income level rises. To explain these facts, I present a multi-sector model with non-homothetic preference and heterogenous agents in terms of different income levels. In equilibrium, the individuals will not consume all the goods available in the market. While the income elasticity falls as income increases at the individual level, it may not at the aggregate level. The extensive margin of consumers is important to understand this result. Within this framework, I show that income inequality may have negative effects on an industry with income elasticity larger than 1. More importantly, this effect is getting stronger as income levels increase.

1. Introduction

Structural transformation is a stylized fact along economic growth. As GDP per capita increases, the employment share falls in agriculture, increases in services sector, while displays a hump shape in manufacturing sector (see Kuznets (1966)). Recently, the literature of structural transformation has identified several driving forces of structural change in both the demand and supply side. In the demand side, if the income elasticities differ across industries, then changes of income will induce structural transformation (e.g., Kongsamut et al., 2001; Foellmi and Zweimuller, 2008).[1]

In this paper, I discuss the impact of income distribution on structural transformation through demand side. To empirically motivate the impact of income inequality on structural transformation, I regress the employment share of services sector on the measures of income inequality and other variables. Using panel data of 17 countries over about 50 years, I find that more unequal distribution imply lower level of employment share in services sector. In addition, the negative effect gets stronger as income level increases.

These results are inconsistent with the models emphasizing the demandside mechanisms. For the models with non-homothetic preferences but linear expenditure functions, say, Kongsamut et al. (2001) and Herrendorf et al. (2013b), there should be no correlation between those two variables. For the models with very general preferences, say, the Almost Ideal Demand System (AIDS) developed by Deaton and Muellbauer (1980), the demand is a convex function of total expenditure for the goods with income elasticity larger than 1 (or the luxury goods). Therefore, these preferences should always predict positive relationships between income inequality and the share of services, as the income elasticity for services sector is generally larger than 1.

To reconcile the empirical results, I then present a model with non-homothetic preference and heterogenous agents in terms of different income levels. In equilibrium, consumers endogenously determine the sets of goods to consume. The feature of this preference is that the income elasticity of a good is initially very high, and eventually falls to below unity as income increases. This is well in line with the non-linear Engel curves.[2] However, the income elasticity for a product at the aggregate level may not decrease as income increases. This is the case for the goods consumed by only some people. Higher average income will induce more people to buy that product (the extensive margin) and existing consumers to consume more (the intensive margin). According to the preference, the income elasticity for the new consumers is very high, and this will offset the decreasing income elasticities for the old consumers. When income follows Pareto distribution, the model can be analytically solved.[3] Within this framework, I show that income inequality may have negative effects on the industry with income

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[1] Examples in the supply side are Ngai and Pissarides (2007) on productivity differences, Acemoglu and Guerrieri (2008) and Liu (2012) on differences in factor intensity across sectors. Herrendorf et al. (2013a) provides an excellent survey on this literature.

[2] The Engel curves can be non-linear in many cases (see e.g., Lewbel., 2006). Thus it is reasonable to have a model with preferences of non-linear Engel curves.

[3] Pareto distribution is a good proximate for income or wealth distribution, see Jones (2015).

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elasticity larger than 1. More importantly, this effect gets stronger as income levels increase, which is consistent with what the empirical evidences.

The intuition is as follows. With higher inequality, some people could not afford a product any more, and these people have very high income elasticities, which will greatly hurt the total demand. In addition, the density function of Pareto distribution is decreasing in income, so the number of individuals is larger for the group with relatively low income levels. Therefore, with more unequal distribution, the decrease of demand by the poorer consumers is larger than the increase of demand by the richer consumers, even for an industry with income elasticity larger than 1 at the aggregate level,

To this end, one contribution of this paper is to highlight that understanding how the macro-level variables are aggregated over individuals is important. Even if we know the income elasticity for a product is larger than unity from aggregate data, we may not immediately infer whether more unequal distribution would increase the total demand for that product or not.

In terms of the model itself, I introduce Pareto distribution into the theoretical analysis of income distribution. The functional form of Pareto distribution makes the model quite tractable and delivers closed-form solution. This is a nice property in the model with both non-homogeneous preference and heterogeneous agents, as well as multi-industries.

This paper is closely related to and follows Foellmi and Zweimuller (2008). Unlike that paper, the purpose of this paper is not to present a unified model with both structural change and balanced economic growth.[4] Instead, I focus on a static model, and discuss the impact of income inequality on structural transformation. Murphy et al. (1989), Matsuyama (2002) and Foellmi and Zweimuller (2006) use similar preferences, and discuss the impact of income distribution. Based on their insights, I characterize income distribution in a more realistic way, that is, in the form of Pareto, and show the extensive margin matters for the results.

The rest of this paper is organized as follows. Section 2 will show the empirical evidences. I present a model to provide the intuition why inequality may have negative effect on the share of services in Section 3. Section 4 will conclude this paper.

2. Empirical evidences

In this section, I present the empirical evidences about the impact of income inequality on the employment share of services sector. I employ a unbalanced panel of 17 countries from 1956 to 2004. The reason to focus on services sector rather than manufacturing is that the employment share increases monotonically increases in services, while experiences a hump-shape path, as average income increases (Herrendorf et al., 2013a). Therefore, it will deliver clearer results to work with services sector.

2.1. Regression Specification and data sources

The main objective of this paper is to check whether income inequality has significant effect on services share, and whether the effects are different at different stages of growth. So I add both the measure of income inequality and the interactions of income inequality and GDP per capita in the regressions. In addition, I follow the theoretical literature on structural transformation to choose other explanatory variables. For the demand side, the income elasticity of services goods is presumably higher than agriculture and manufacturing goods, as in Kongsamut et al. (2001). That is, as income increases, the employment or output share of services sector will increase. Therefore, GDP per capita is included as an explanatory variable. For the supply side, productivity differences across sectors will induce labor reallocations, according to Ngai and Pissarides (2007). To control the supply-side forces, I add labor productivity in agriculture, manufacturing and services sector into the regression equation.

The basic fixed-effect regression model is

$$Sershare_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 Inequality_{it} + \beta_3 GDP_{it} * Inequality_{it} + \beta_4 X_{it} + Country_i + Year_t + u_{it}$$

where the subscripts i and t mean country and year, respectively. $Serviceshare_{it}$ is the employment share in services sector.[5] GDP_{it} represents GDP per capita, and $Inequality_{it}$ is the measure of income inequality. $GDP_{it} * Inequality_{it}$ is the interaction of GDP_{it} and $Inequality_{it}$. X_{it} is a vector of other control variables, including labor productivity in agriculture, manufacturing, and services sector, denoted as $prodagri$, $prodmanu$, and$prodser$. $Country_i$ and $Year_t$ are country and year fixed effects, respectively. Error term is denoted by u_{it}.

The data on employment share and sector-level labor productivities are from Duarte and Restuccia (2010). They constructed a panel dataset on PPP-adjusted real output per hour and sector-level output and hours worked for agriculture, industry, and services. The panel data include 29 countries with annual data covering the period from 1956 to 2004.[6] The reason to choose this dataset is that it provides employment shares in terms of hours worked at the sectoral level, which I believe is a better measure than that with only number of workers. In addition, the sector-level variables are adjusted to keep consistency so that they are suitable for cross-country analysis.

To better match this panel, I take advantage of the World Top Income Database (WTID) to get information on income inequality.[7] In the regressions, I choose the Inverted Pareto-Lorenz coefficient as the measure of income inequality. Larger value of this coefficient means more unequal distribution. The negative correlation between employment share of services and inequality is shown in Fig. 1.

Combining the two databsets, I get an unbalanced panel data of 17 countries from 1956 to 2004.[8] The statistics of the variables are listed in Table 1.

2.2. Results

The regression results are presented in Table 2. There are country and year fixed effects in all regressions. And the standard errors are clustered at the country level. Column (1) of Table 1 only includes GDP_{it} and $Inequality_{it}$ as the independent variables. The coefficient of $Inequality_{it}$ is negative, although not significant. However, when controlling the sector-level productivities, the effect of inequality becomes significantly negative, as in column (2). This suggests that more unequal distribution would induce lower services share. Then I add the interaction term in the regression as in Column (3). The

[4] As Herrendorf et al. (2013a) suggests that, "while the search for specifications that can simultaneously yield structural transformation and balanced growth have proven to useful in organizing research, exact balanced growth should not be imposed as a requirement moving forward".

[5] The reason to use employment share rather than output share, is that employment is relatively easier to measure, thus more accurate. Since price level at the sectoral level are different across countries, it's difficult to get data on real output at the sectoral level that are comparable both across countries and over time. In addition, the focus on employment share is consistent with most papers on structural transformation.

[6] Please refer to Duarte and Restuccia (2010) for the details about the dataset.

[7] For the construction and limitations of this database, please refer to Atkinson et al. (2011) and its webpage at http://topincomes.g-mond.parisschoolofeconomics.eu. Actually, there are not many datasets on income distribution available, especially for multi-countries over years. The World Bank Indicator contains information on Gini coefficient and income shares for different quantiles. Unfortunately, the data are just for selective years as well as selective countries, which is not feasible for panel-data analysis. Then I turn to the WTID dataset, which contains information on income distribution of the richest group, say, the groups of the top 1 percent or top 10 percent.The results are robust to other measures of income inequality, which are available upon request.

[8] The countries in this subsection are Argentina, Australia, Canada, Colombia, Denmark, France, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, U.S., and U.K.