Inequality in the Balance of Payments Constrained Growth: a decomposition of import income elasticities

Working paper

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Abstract

The link between inequality and growth is an old topic for Post-Keynesian economists. In a demand-led economy, income distribution affects the growth of the demand components and, thus, overall growth of the economy. Thirlwall, however, argues that in the long run, it is the constraint to demand that will determine growth rates. This paper contributes to the literature both theoretically and empirically. The first part of the paper develops a theoretical model where income inequality is exposed on Thirlwall's law by a decomposition of import elasticities by income group. The second part of the paper illustrates the case with data for the US economy. Different import income elasticities along the distribution affect not only the growth rate of a country, by the traditional Post-Keynesian demand channel, but also the limits for a long-run growth given by the Balance of Payments Constraint. Income inequality has to be considered when promoting a structural change that increases a country's growth rate consistent with balance-of-payments equilibrium.

Keywords: inequality, import income elasticities, non-homethetic preferences, Balance of Payments Constrained Growth

1 Introduction

Classical Political Economists and Post-Keynesians emphasize the role of bargaining power and see distribution as essential for understanding the development of a capitalist economy. In a demand-led economy, income distribution affects the growth of the demand components and, thus, overall growth of the economy. However, less explored in the Post-Keynesian literature is the fact that inequality may also affect the balance of payments of an economy if preferences and income elasticities are non-homothetic, for example. Thirlwall et al. 1979 argues that, in the long run, it is the balance of payments (BP) constraint to demand that will determine growth rates.

> The BPCG framework assumes that aggregate demand drives output in the long run as well as the short run, while potential output on the supply side is endogenous and adjusts (within limits) in response to demand pressures or shortfalls. Unlike other post-Keynesian models, however, the BPCG approach is distinguished by a focus on external rather than internal sources of demand (Blecker 2022, p. 430)

Hence, the balance-of-payments equilibrium growth rate of a country is achieved by equalizing the growth of export and import demand. Assuming the Marshall Lerner condition or Purchasing Power Parity in the long run, the resulting equilibrium rate of growth will depend on the relative income elasticities of imports and exports, and on the growth rate of the country's trade partners. Alternatively, it can also be expressed as the ratio between the growth rate of exports and the import income elasticity. In this connection, Thirlwall argues that "the only sure and long-term solution to raising a country's growth rate consistent with balance-of-payments equilibrium is structural change to raise its income elasticity of exports and to reduce its income elasticity of imports" (Thirlwall 2002, p. 78). This is, in fact, a common conclusion of BPCG models: that the productive structure is important for growth sustainability, and thus structural change is the way to increase long run growth.

However, there are few attempts to include the distribution of income in such discussion. Most of the work relating the BPCG to income distribution either consider demand effects of (functional) income distribution, where a distribution that boosts growth can also affect imports, or include a via mark-up pricing equation, emphasizing the role of real exchange rates in affecting the path towards equilibrium (even if not affecting Thirlwall's law itself).

Araujo and Lima 2007 built a multisectoral Thirlwall's law and emphasize that "different dynamic patterns of human needs and preferences give rise to different compositions of demand, and thus different balance-of-payments equilibrium growth rates, in each country". Even though their model don't explicit treat issues of inequality – in fact, they treat all variables in per capita terms – it provides important reasoning to think about structural change (as the share of sectors in total economy) and income elasticities for individual goods as being affected by inequality.

Francois and Kaplan 1996 and Hummels and Lee 2018 discusses the role of income distribution to define trade patterns. If preferences are non-homothetic, then changes in the level of individual income affects their preferences and income elasticities for certain goods. Hence, in this connection, changes in the distribution of income within a country would also change demand patterns and, consequently, affect import income elasticities and the balance of payments.

In this connection, one can ask how can inequality itself affect structural change and, hence, the Balance of Payments? In other words, do lower income groups orient their expenditures towards the output of domestically produced tradables, while the affluent go after foreign-produced, as cars and phones, for example? If so, changing distribution changes the composition of demand which changes the composition of output (domestically) and the import basket – all of which can change the ratio that drives Thirlwall's law. This paper attempts to answer such questions, theoretically and empirically contributing to the litera-

ture. The first part of the paper introduces the Thirlwall Law's framework and suggests a decomposition of import elasticities to include income distribution. Suppose different deciles have different income elasticities of imports. In that case, the overall income elasticity of imports is a weighted average of the income elasticities of each decile, where the weights are the shares of total income appropriated by each decile. In this way, changing the share of income of each decile changes the income elasticity of imports and Thirlwall's law. In the second part of the paper, I then pursue an econometric exercise to illustrate the hypothesis of different income elasticities by decile for the US economy. I then conclude summarizing the results and pointing to next steps and further research.

2 Literature Review

As mentioned in the introduction of this paper, Thirlwall's law is the resulting growth rate in the Balance of Payments Constrained Growth (BPCG) model. Hence, in this section, I present the and then extend it to include income distribution in Thirlwall's law. The baseline model was taken from Blecker and Setterfield 2019.

The basic model was first articulated by Thirlwall et al. 1979 and assumes that exist only two goods: a domestically produced good that can be either used for domestic demand or exported and a foreign-produced imported good (Blecker and Setterfield 2019). The two goods are not perfect substitutes and can have different prices (measured in the same currency). The supplies of such goods are infinitely elastic, so the quantities traded in equilibrium are determined by demand.

The export demand function is given by

$$X = X_0 \left(\frac{EP_f}{P} \right)^{\varepsilon_X} Y_f^{\eta_X} \tag{1}$$

where e X is the quantity of exports, X_0 is a positive constant, E is the nominal exchange rate (in home currency per unit of foreign currency), P_f is the 'foreign' (or rest-of-world) price level in foreign currency, P is the home price level (in domestic currency), Y_f is foreign (world) income, and $\varepsilon_X > 0$ and $\eta_X > 0$ are the price and income elasticities of export demand, respectively.

In the same way, the import demand function is given by:

$$M = M_0 \left(\frac{EP_f}{P} \right)^{-\varepsilon_M} Y_f^{\eta_M} \tag{2}$$

where where M is the quantity of imports, M_0 is a positive constant, Y is home country national income, and $\varepsilon_M > 0$ and $\eta_M > 0$ are the price and income elasticities of import demand, respectively.

The Balance of Payments equilibrium occurs when there's balanced trade in goods and services, in the domestic currency:

$$PX = EP_f M \tag{3}$$

Transforming that into growth rates (taking natural logarithm and differentiating with respect to time), we get:

$$\hat{P} + \hat{X} = \hat{E} + \hat{P}_f + \hat{M} \tag{4}$$

where the hat above the variable indicates growth rates. For better disposition, from now one I'll use lower-case letters to indicate the growth rate of real variables (i.e. $x = \hat{X}$ and $m = \hat{M}$).

$$\hat{P} + x = \hat{E} + \hat{P}_f + m \tag{4'}$$

To substitute the export and import demand growth in equation (4), we need to transform equations (1) and (2) into growth rates:

$$x = \varepsilon_X(\hat{E} + \hat{P}_f - \hat{P}) + \eta_X y_f \tag{5}$$

$$m = -\varepsilon_M(\hat{E} + \hat{P}_f - \hat{P}) + \eta_M y \tag{6}$$

where it is assumed that the exogenous component of exports (X_0) and imports (M_0) is constant over time. I use the same notation as before: $y = \hat{Y}$ is the growth rate of domestic output and $y_f = \hat{Y}_f$ is the foreign country's (or world's) growth rate. Substituting (5) and (6) into (4), we get:

$$(\varepsilon_X + \varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P}) - \eta_M y + \eta_X y_f = 0 \tag{7}$$

It is assumed that the elasticities ε_i and η_i ($i = M, X$) are constant[1], and the foreign income growth is exogenous (i.e., it is a small open economy that cannot affect the growth rate of the rest of the world). Hence, for the equilibrium condition to be satisfied, either the relative prices ($RER = \hat{E} + \hat{P}_f - \hat{P}$) or output ($y$) needs to be adjusted. Thirlwall follows the Keynesian assumption that output is the adjusting variable. Hence, the growth of output in the balance of payments equilibrium (y_B) is:

$$y_B = \frac{(\varepsilon_X + \varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P}) + \eta_X y_f}{\eta_M} \tag{8}$$

Now, if the first term on the right hand side is equal to zero ($(\varepsilon_X + \varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P}) = 0$), we get the alternative solution for Thirlwall's law:

$$y_B = \frac{\eta_X y_f}{\eta_M} \tag{9}$$

The term $(\varepsilon_X + \varepsilon_M - 1)(\hat{E} + \hat{P}_f - \hat{P})$ can be considered equal to zero for a couple of reasons. First, note that the first part of it is associated with the Marshal-Lerner (ML) condition. The Marshal-Lerner condition says that $\varepsilon_X + \varepsilon_M > 1$, that is, that a devaluation

[1]This is exactly the assumption that I'll relax later in the paper, discussed in the next section.

would improve the trade balance due to price-effects on imports and exports. However, this condition has been challenged in the literature, with authors arguing that, in the long run, currency devaluations have no impact on the trade balance. This would mean that $\varepsilon_X + \varepsilon_M \approx 1$, and thus the term associated with the price elasticities would become zero (this reason is sometimes referred to as "elasticity pessimism"). The other argument for the first term on the equilibrium equation to be zero is related to the evolution of relative prices – the RER, in this case. Even if the ML holds in the long run, real devaluations or appreciations cannot occur indefinitely, so that $\hat{E} + \hat{P}_f - \hat{P} = 0$. "This would occur if, for example, domestic price changes closely mirror changes in prices of foreign goods converted to the domestic currency in an open economy – especially when a nominal depreciation causes (perhaps after some time lag) an offsetting increase in domestic inflation." (Blecker and Setterfield 2019, p. 430). In either case, the BP-equilibrium expression (8) is reduced to (9), and this is the BP-equilibrium equation I'll refer to moving forward. One final note about equation (9) is that, under the assumption of constant RER in the long run, $x = \eta_X y_f$. Hence, the BP-equilibrium growth rate can also be written as the ratio between the growth rate of exports and the income elasticity of demand for imports. Blecker and Setterfield 2019 call this the "weak version" of Thirlwall's law.

Thirlwall's law and the studies and extensions that come after it emphasize the role of structural change in the economy, giving space for supply-side policies in increasing the rate of growth compatible with BP-equilibrium. As equation (9) shows, a country's BP-equilibrium rate of growth is higher the higher the income elasticity of exports and the lower the income elasticities of imports. Hence, as a policy prescription, countries should try to increase the income elasticity of their exports by focusing on producing more technologically sophisticated goods instead of basic commodities, for example. In the same connection, the less dependent on the imports of more technological goods, the better.

This policy implication led to several empirical and theoretical extensions of the BPCG model, emphasizing structural change. Araujo and Lima 2007 developed a multi-sectoral Thirlwall's law (MSTL), where the income elasticities of demand for exports and imports are decomposed in weighted averages of the industry-level income elasticities. In a simple form, it can be described as

$$y_{MS} = \frac{\sum_{j=1}^{N} \alpha_j \eta_{X,j}}{\sum_{j=1}^{N} \beta_j \eta_{M,j}} y_f \tag{10}$$

where $j = 1, ..., N$ indexes the industry, α_j is the share of industry j in total exports, β is the share of industry j in total imports and $\eta_{i,j}$, just like before, is the income elasticity of imports or exports ($i = M, X$) of each industry j, and N is the number of industries considered. Hence, Starting from a Pasinettian multi-sectoral dynamics, Araujo and Lima 2007 show that Thirlwall's law depend not only on the individual elasticities, but also on the relative share of each industry in total exports and imports. This means that, even if the elasticities are considered constant over time, the ratio that drives Thirlwall's law can vary with the sectoral composition of exports and imports – i.e., with structural change. However, in order to get to their final version of Thirlwall's law, they develop the model in

per capita terms, considering the elasticities as being specific of the good, and not varying by income.

Gouvêa and Lima 2010 empirically test the multisectoral Thirlwall's law for some Latin American and Asian countries. They find that the original Thirlwall's law holds for all sample countries except South Korea, while the multisectoral one holds for all of them. Gouvea and Lima 2013 expand the group of countries analyzed, including a panel dataset of 90 countries grouped by income levels, and confirm the support for the multisectoral version. Employing product-specific quality-adjusted price indexes, Romero and McCombie 2016 also estimates the multisectoral Thirlwall'a law for developing economies, confirming the previously found results that the multisectoral version hold for the countries analyzed and provides more robust results than the original version. In addition, they show that the income elasticities of imports and exports are higher for medium- and high-tech manufactures, strengthening the argument for the need for structural change to increase the rate of growth compatible with BP-equilibrium.

The literature has also tried to link the BPCG models to income inequality. To my knowledge, that was done mainly in two ways: (i) taking into account demand effects of (functional) income distribution, where a distribution that boosts growth can also affect imports, and (ii) via mark-up pricing, bringing back the role of real exchange rates.

Blecker 1998 combines Thirlwall's BPCG model with mark-up pricing and partial exchange rate pass-through to discuss the Post-Keynesian quantity adjustments and the Neoclassical price adjustments. Changes in the exchange rate thus affect prices and, consequently, the distribution that, in turn, affects demand and output. In this way, Blecker 1998 was able to include the functional distribution of income into the BP-equilibrium framework via international competitiveness. Nishi 2019, interacting the BPCG approach with Goodwin cycles, assumes a conflict model of inflation, where the conflict between workers and capitalists on their desired shares drives inflation and, consequently, affects the RER. Including the dynamics of employment and labor-saving technological progress in the model, the author arrives at a solution that "ensures that output growth follows a modified Thirlwall's law that allows for endogenous changes in domestic prices" (Blecker 2022, p. 455).

In this connection, income distribution is connected with the discussion on the role of real exchange rates in affecting the BP-equilibrium growth rate (Blecker 2022). Having the multisector Thirlwall's Law in mind, one can argue that changes in the RER can affect the shares of each sector in total exports, thus changing the growth rate. Criticisms of this approach emphasize exactly the role of income distribution (Ribeiro, McCombie, and Lima 2017): "the competitive benefits of RER depreciation can be offset by increased costs of imported intermediate goods in domestic currency as well as redistributive effects (raising the profit share and lowering the wage share) of the depreciation" (Blecker 2022).

Few studies have considered how changes in the income distribution affect consumption patterns and, thus, the income elasticities. Discussing the effects of RER in promoting growth in the BPCG framework, Ribeiro, McCombie, and Lima 2016 is the only theoretical model that directly includes the effect of income inequality on the elasticities. Their model consists of a two-country system: a rich foreign country and a poor domestic one. They

endogenize the income elasticities to investigate the effect of "a currency devaluation on the home country's non-price competitiveness via changes in the technology gap and income distribution" (Ribeiro, McCombie, and Lima 2016, p. 550). The two key assumptions are that (i) the higher the technological capabilities (the lower the technological gap) between the domestic country and the foreign country, the higher the possibility of non-price competitiveness, and (ii) income inequality affects consumption patterns and, thus, the non-price competitiveness of a country – the final effect on elasticities is ambiguous, and depends on the source of distributional shift (productivity versus real wage). "The model is then reduced to a system of two simultaneous differential equations in the wage share and the inverse technological gap, where the equation for the latter is nonlinear and multiple equilibria can arise " (Blecker 2022, p. 443). Ribeiro, McCombie, and Lima 2016 conclude by pointing out that, even though a large part of the literature emphasizes the positive effects of RER devaluations in the long-run growth, taking distributional and consumption pattern effects into account can offset this result.

In an attempt to contribute to the above literature, the next subsection discusses the role of income distribution in determining income elasticities, especially the income elasticities of imports. I first present the theoretical motivation and then pursue a simple accounting decomposition of Thirlwall's law to include personal income distribution.

2.1 Distributional Thirlwall's Law

With the exception of Ribeiro, McCombie, and Lima 2016, no other theoretical model considers the income elasticities endogenous and dependent on the income distribution. The literature also lacks models connecting personal income inequality to the BPCG framework. This is the first contribution of this paper: highlighting the fact that, in the same way that the productive structure and relative sectoral shares can affect the elasticities in the multisectoral version of Thirlwall's law, the personal income distribution and the relative shares of total national income by income group can affect the aggregated elasticities. If income groups (decile, quantiles) have different income elasticities, changing the proportion of national income appropriated by each group can change the aggregated elasticity, ceteris paribus.

The idea of income elasticities being dependent on income level is not new to the literature. Francois and Kaplan 1996 show that both the level and the distribution of income matter for trade patterns. Inspired by the 'Linder hypothesis', they show that preferences are non-homothetic, especially for Linder-type product characteristics, and that income distribution is a significant factor in determining aggregate expenditures. Hummels and Lee 2018 also argue that income elasticities vary with income, i.e., that preferences may not be homothetic. To show that, they estimate a Quadratic Almost Ideal Demand System (QUAIDS), which is a demand system that allows income elasticities to depend non-linearly on income and prices. They estimate income elasticities that are time-good-income varying, using the Consumer Expenditure Survey (CEX) data, and find that the data reject that the ratio of income elasticities for two goods is constant across income levels.

> The combination of expenditure shares and elasticities varying over good-income-time means that even a uniform income shock will result in large changes in the distribution of expenditures across goods categories. Moreover, income shocks are not uniform, and there are pronounced differences in the distribution of income shocks during recent crisis periods. In the period just before the Dot-Com Crash of 2000–01, higher income households experienced a sharp increase, then a more pronounced slowdown in incomes, while changes for lower income households were more muted. In the period just before the Great Trade Collapse of 2008–9, the rise and fall of expenditures was more pronounced in lower and middle income households (Hummels and Lee 2018, p. 21).

The connection between inequality and foreign trade was also explored in the literature. As an application of their finding on non-homothetic preferences, Hummels and Lee 2018 use the calculated elasticities to explain part of the variation in trade. They argue that, because income elasticities vary across income groups, a crisis that affects the groups differently would have different impacts on trade. They then conclude that "income-induced expenditure shocks are positively correlated with the cross-good pattern of import changes, and during the Great Trade Collapse these shocks generate a predicted change as much as 40% as large as the raw variation in import declines" (Hummels and Lee 2018, p. 33).

Multisectoral Thirlwall's Law can thus be decomposed to include different income elasticities of imports among income groups. Consider the "weak form" (Blecker and Setterfield 2019) of equation (10) presented previously:

$$y_{MS} = \frac{x}{\sum_{j=1}^{N} \beta_j \eta_{M,j}} \tag{10'}$$

where x is the country's export growth rate. If we consider that income elasticities vary with income levels, we can then decompose the income elasticities of imports $\eta_{M,j}$ as a weighted average:

$$\eta_{M,j} = \sum_{i=1}^{I} \alpha_i \eta_{M,j,i} \tag{11}$$

where $i = 1, ..., I$ represents the income groups (deciles, quantiles, etc), $\eta_{M,j,i}$ the respective income elasticities for good j and income group i, and α_i the share in total income of income group i, with $\sum_{i=1}^{I} \alpha_i = 1$.

If import income elasticities of the different income groups are the same, changing the weight α_i, i.e., the income share, makes no difference in total import income elasticities. However, as I argued previously and intend to show in the empirical exercise that follows, import income elasticities do vary with the income level; thus, inequality changes affect the economy's import income elasticity. In other words, if income groups maintain their income elasticity over time, regardless of the absolute income growth – as I'll assume in the next section –, changes in the relative income will affect the elasticity of this economy.

In the next section I estimate income elasticities for group of goods for the US, separated by income deciles and quintiles to illustrate some of the arguments made here.

3 Empirical Exercise

The empirical exercise proposed here consists on estimating income elasticities by good-income. In this way, the hypothesis of different income elasticities for certain goods, that depend on the income level of that group, can be tested. To do this, I use the Consumer Expenditure (CE) survey, a quarterly survey conducted by the Bureau of Labor Statistics (BLS) in the US that has been conducted continuously since 1980. The survey is large, consisting of over 5,000 households in each wave. "Each household is interviewed about their expenditures for up to four consecutive quarters. Each interview records expenditures in detailed categories over the preceding three months. The final interview records information on earnings, income, and taxes from the preceding 12 months, aligning with the period captured for expenditures. Income, expenditure, and savings are all recorded at the household level" (Aguiar and Bils 2015). In addition, demographic characteristics are asked of the person of reference in the household – the person that answers the survey.

Several works use this survey to understand consumer budget allocation and, in particular, income elasticities. However, more recent studies have shown that the CES has really poor data on expenditures after 1996 and does not match the National Income and Product Accounts (NIPA) definitions (Aguiar and Bils 2015; Cynamon and Fazzari 2017). For this reason, I follow Aguiar and Bils 2015 adjustments on after-tax income, detailed in the chapter's Appendix A. In addition to that, following the authors, I use the estimations of income elasticities from 1994-96 of the CES data, as they are the most reliable years. As a robustness check, I also estimate income elasticities for every year after that (1994 to 2010). My results suggest that they are fairly stable over time (see Appendix B).

After adjusting the data, Aguiar and Bils 2015 are left with 62,734 households from 1980-2010. I then created 10 deciles by real before-tax income with this final data. Because the top and bottom 5% were excluded from the sample to avoid outliers, the first and last income groups correspond to the 5-10th percentiles and 90-95th percentiles, respectively. All the others (from 2nd to 8th) are the corresponding deciles. Tables A2 and A1, in the Appendix, show the real after-tax income and quantity of households left in the sample in each decile by year. Table 1 describes the 20 expenditure categories and the expenditure share for the whole sample (1980-2010), separated by deciles.

As expected, we see that Housing is the largest expenditure category. Food at home is the second largest expenditure category for the first four quartiles, replaced by Vehicle purchase, leasing and insurance from the 5th quantile onwards. It is also interesting to note how the expenditure shares change with income distribution. We see that Vehicle purchasing, Health, Entertainment, Furniture, Education, Domestic services and Personal Care increase their expenditure shares as we climb up on the income distribution. On the other hand, housing, Food at Home, Appliances and phones, Shoes and Tobacco and other smoking have the opposite behavior: their expenditure shares decrease with income. All other transportation, Utilities, Food away from home, Men's and Women's clothing, Alcoholic beverages and Children's clothing expenditure shares are pretty stable over the income distribution.

Table 1: Expenditure share of each expenditure category, by decile

	1	2	3	4	5	6	7	8	9	10	Total
Housing	31,1	30	29,7	29,1	28,8	28,3	28,4	28,2	28,7	29,1	29,05
Food at Home	16,9	14,6	13,2	12,5	11,8	11,3	11	10,3	9,6	9,1	11,91
Vehicle purchasing, leasing, insurance	8,9	10,8	11,2	12,3	12,7	12,9	13	13,2	12,9	12,1	12,18
All other transportation	7,4	7,9	8,1	7,9	8	7,9	7,8	7,7	7,6	7,2	7,79
Utilities	4,2	4,9	5,3	5,4	5,5	5,4	5,2	4,9	4,7	4,5	5,07
Health expenditures including insurance	3,7	3,9	4,3	4,4	4,4	4,6	4,7	4,8	5	5,2	4,52
Appliances, phones, computers with associated services	7	6,6	6,1	5,8	5,6	5,3	5,1	4,8	4,6	4,3	5,52
Food away from home	5,1	5,2	5,1	5	5	4,9	4,9	4,8	4,7	4,5	4,92
Entertainment equipment and subscription television	1,6	1,7	1,9	1,9	1,9	2	2,1	2,2	2,4	2,5	2,03
Men's and women's clothing	1,3	1,2	1,2	1,2	1,1	1,2	1,2	1,3	1,3	1,5	1,24
Entertainment fees, admissions, reading	0,9	1,1	1,1	1,2	1,3	1,4	1,5	1,6	1,7	1,9	1,35
Cash contributions (not for alimony/support)	3,4	3,4	3,7	3,8	3,9	4,2	4,2	4,3	4,2	3,9	3,93
Furniture and fixtures	1,1	1,2	1,5	1,6	1,8	1,9	2,1	2,3	2,5	2,7	1,86
Education	0,7	0,9	1	1,1	1,2	1,3	1,5	1,7	1,8	2,1	1,33
Shoes and other apparel	1	0,9	0,9	0,8	0,8	0,8	0,8	0,8	0,8	0,7	0,83
Domestic services and childcare	0,6	0,8	1	1	1,2	1,4	1,5	2	2,5	3,1	1,48
Alcoholic beverages	0,8	0,7	0,8	0,8	0,8	0,8	0,8	0,8	0,9	0,8	0,81
Children's clothing (up to age 15)	1	0,9	1	1	1	0,9	0,9	0,9	0,9	1	0,96
Personal Care	1,2	1,5	1,8	1,9	2,1	2,3	2,4	2,6	2,8	3,2	2,18
Tobacco, other smoking	1,9	1,6	1,3	1,2	1,1	1	0,8	0,7	0,5	0,4	1,04

3.1 Estimation Strategy

I econometrically estimate income elasticities for income groups in this subsection, following Aguiar and Bils 2015. Aguiar and Bils 2015 estimate an instrumental variable regression – they argue that miss-measurements in total income (or total expenditure) can be correlated to the error term, and, thus, an instrument for it is needed. They test two different instruments:

> The first exploits the fact that total expenditure reflects permanent income and will thus be correlated with current income. Specifically, we instrument total expenditure with dummies for the household's income group as well as the continuous variable log after-tax income. The second approach exploits the fact that households in the CE report total expenditure in separate interviews for each of

> four quarters. This allows us to divide each households spending into that over its first two quarters versus its final two (Aguiar and Bils 2015, p. 2740).

Nonetheless, as they say in the quote above, their first instrumental variable is based on the permanent income hypothesis. Hence, I choose to follow their estimation using the second instrument – estimations with the first instrument can be found in the Appendix.

Their estimated equation is:

$$\tilde{x}_{hjt} = \alpha_{jt} + \beta_j ln X_{ht} + T_j Z_h + u_{hjt} \tag{12}$$

where h index households, j the expenditure categories and t time, $\tilde{x}_{hjt} = \dfrac{x_{hjt} = \bar{x}_{jt}}{\bar{x}_{jt}}$ is the percentage deviation from average expenditure on that good in that year[2], lnX_{ht} is the logarithm of total expenditure (that will be instrumentalized), Z_h is a vector of demographic dummies based on age range (25–37, 38–50, 51–64), number of earners ($<$ 2, 2+), and household size ($\leq$ 2, 3-4, 5+), whose coefficients T_j vary among expenditure groups and u_{hjt} an error term assumed to contain systematic measurement errors as well as idiosyncratic taste shocks and miss-measurement.

In addition to following their estimation, I also estimate a linear model with the total expenditure variables not instrumentalized. In other words, I estimate a regular Ordinary Least Square (OLS) model: precisely the same equation (12). Furthermore, I maintain the same demographic variables as control and keep the percentage deviation from average as the dependent variable. Finally, because the estimations separated by income groups were too volatile over the years, I take the average between 1994-1996.

Table 2 shows the results for the IV estimation, where the "total" column replicates Aguiar and Bils 2015 findings. Table 3 shows the OLS estimation results for equation 12 – i.e., with total expenditures not instrumentalized.

[2]The authors use this variable as an alternative to the log deviation from average. They do so because some households have zero for some expenditure categories. This deviation from the average comes from a first-order linear expansion of Engel's curve.

Table 2: Income Elasticities IV Estimates by Decile – instrumenting Q45 expenditure with Q23 expenditure

Category	1	2	3	4	5	6	7	8	9	10	Total
Alcoholic beverages	0,62	0,53	0,94	0,72	1,00	1,41	1,32	1,49	2,58	2,87	1,14
All other transportation	0,51	0,62	1,03	0,38	0,72	0,99	1,07	1,47	1,35	1,72	0,91
Appliances, phones, computers with associated services	0,66	0,51	1,27	0,97	0,88	1,22	1,51	1,27	1,27	1,30	0,94
Cash contributions (not for alimony/support)	0,20	0,47	0,74	0,94	0,74	1,95	0,44	-0,39	0,42	1,31	1,26
Children's clothing (up to age 15)	0,19	0,70	0,53	1,22	0,50	0,44	0,42	1,58	2,37	2,37	0,83
Domestic services and childcare	0,40	0,82	1,57	2,71	1,61	2,57	1,05	3,38	2,75	5,61	1,8
Education	0,12	1,34	1,78	0,63	1,07	1,97	3,31	3,54	4,04	9,16	1,88
Entertainment equipment and subscription television	0,51	0,68	0,83	0,77	2,09	1,44	1,08	1,39	2,54	2,30	1,22
Entertainment fees, admissions, reading	0,84	0,86	1,23	1,32	1,61	2,17	1,42	2,28	2,97	3,30	1,65
Food at Home	0,43	0,35	0,60	0,42	0,64	0,78	0,78	0,76	0,62	0,81	0,47
Food away from home	0,56	0,47	1,32	1,00	1,17	1,80	2,02	1,62	2,62	2,50	1,32
Furniture and fixtures	0,39	1,33	1,54	1,15	0,66	1,28	1,84	3,68	4,28	0,83	1,55
Health expenditures including insurance	0,73	0,90	1,25	1,45	1,25	1,56	1,26	2,72	0,95	1,09	1,11
Housing	0,63	0,76	0,88	0,86	0,93	1,00	1,12	1,38	1,36	1,27	0,93
Men's and women's clothing	0,73	0,43	1,63	0,87	1,17	1,78	2,51	2,07	2,87	1,80	1,38
Personal Care	0,70	0,24	0,99	0,80	0,84	1,39	1,33	1,94	1,42	1,46	0,96
Shoes and other apparel	0,44	0,72	1,06	0,66	0,98	1,53	1,93	2,35	3,85	2,35	1,19
Tobacco, other smoking	0,32	0,24	-0,12	0,13	-0,26	0,45	0,07	0,56	-0,46	0,40	-0,05
Utilities	0,49	0,46	0,88	0,62	0,69	0,63	0,64	0,79	0,68	0,65	0,55
Vehicle purchasing, leasing, insurance	0,53	0,89	0,16	0,64	1,06	-0,31	0,05	0,44	0,49	0,91	0,72

Table 3: Estimated Income Elasticities by Decile - Average of 1994-1996, total expenditures not instrumentalized

Category	1	2	3	4	5	6	7	8	9	10	Total
Alcoholic beverages	0,79	0,34	0,61	0,67	0,71	0,97	0,83	1,34	1,51	2,21	0,97
All other transportation	0,49	0,55	0,80	0,48	0,72	0,91	0,87	1,12	1,20	1,07	0,84
Appliances, phones, computers with associated services	0,46	0,55	0,64	0,81	0,60	0,89	1,01	0,71	1,37	1,13	0,82
Cash contributions (not for alimony/support)	0,14	0,70	0,69	0,99	0,78	1,56	1,05	1,27	1,93	4,35	1,43
Children's clothing (up to age 15)	0,28	0,45	0,46	0,89	0,39	0,53	0,36	0,92	1,78	1,53	0,69
Domestic services and childcare	0,29	0,79	1,14	1,51	1,04	1,51	0,79	1,82	1,66	5,65	1,45
Education	0,26	0,55	1,03	0,51	1,02	1,86	2,36	1,86	3,12	7,73	1,62
Entertainment equipment and subscription television	0,43	0,59	0,90	0,75	1,01	1,09	0,95	1,27	1,80	1,72	1,08
Entertainment fees, admissions, reading	0,58	0,66	0,74	0,81	1,26	1,29	1,58	1,70	2,02	2,17	1,40
Food at Home	0,35	0,30	0,36	0,36	0,49	0,47	0,49	0,45	0,44	0,59	0,40
Food away from home	0,49	0,47	0,85	0,80	0,98	1,30	1,31	1,18	1,82	2,14	1,16
Furniture and fixtures	0,62	0,95	1,33	0,75	0,74	1,44	1,87	1,96	2,97	0,66	1,37
Health expenditures including insurance	0,61	0,78	0,85	0,96	0,96	1,08	0,97	1,48	1,04	1,16	0,94
Housing	0,44	0,57	0,45	0,59	0,64	0,59	0,67	0,73	0,84	1,12	0,75
Men's and women's clothing	0,50	0,41	0,87	0,80	0,91	1,23	1,51	1,47	1,86	2,38	1,18
Personal Care	0,67	0,30	0,70	0,54	0,47	0,73	0,90	1,05	1,00	1,40	0,80
Shoes and other apparel	0,42	0,79	0,59	0,64	0,73	1,16	1,33	1,48	2,11	2,10	1,06
Tobacco, other smoking	0,67	0,14	0,03	0,29	-0,19	0,19	-0,08	0,55	-0,28	0,27	0,00
Utilities	0,38	0,42	0,49	0,46	0,41	0,35	0,32	0,39	0,48	0,49	0,44
Vehicle purchasing, leasing, insurance	1,13	1,52	2,14	2,04	2,57	2,42	2,92	3,55	3,44	2,85	1,83

Looking at each of the estimate elasticities (Tables 2 and 3) it is possible to notice that most of the income elasticities increase as we climb up on income levels. This result was expected for some good categories, like Appliances, phones, computers, Entertainment equipment and subscription television and Domestic Services and Childcare, as those are categories that consist of more luxuries – in the case of electronics, for example – or expensive services in the context of the US – like domestic services. Elasticities on Food at Home, Health Expenditures, and Utilities are more stable, as would be expected since those are necessities categories. The elasticities for Vehicle purchasing, leasing and insurance were expected to be higher for higher income group, but the results show it as quite stable. The reason for that could be the grouping of both purchasing and leasing of vehicles together in the same expenditure category.

The elasticities for the last income bin show higher values, possibly due to higher variation on data. This is the group representing the top 90-95 percentiles and the CES tends to underestimate income and total expenditures at high income groups – as can be noticed on

Table A1, in the Appendix, the income for this group is lower than expected. Hence, those results need to be analyzed carefully.

4 Concluding Remarks

Different import income elasticities along the distribution affect not only the growth rate of a country, by the traditional Post-Keynesian demand channel, but also the limits for a long-run growth given by the Balance of Payments Constraint.

In this paper, I discuss the Balance of Payments Constrained Growth approach and argue that it should include income elasticities in its discussion. The BPCG approach focuses mainly on structural change and on the role of income elasticities of imports and exports in increasing the balance-of-payments equilibrium growth rate of a country. If income elasticities depend not only on the structure of the economy, but also on how income is distributed, one can then finally link the BPCG with inequality.

If preferences are non-homothetic, that is, if income elasticities vary with the income level, changes in distribution will then change the total income elasticity of a country, as well as its expenditure on certain goods. If those goods are then tradable (and imported), this could have consequences for the balance of payments.

The natural next step in this research is to transform the estimated income elasticities into import income elasticities, in order to better access the question proposed here. With that being done, we could address questions like: what would be the change in Thirlwall's law, everything else constant, if there's a change in the income distribution of some certain type? Or, what would be the distributional change needed to reduce the balance of payments deficit by some percentage (10%, 20%)?

Additionally, less explored in this paper but also important for future research is how income inequality can affect the process of structural change itself. In other words, as income inequality changes the consumption pattern of a country, industrial policy aiming at structural transformation, for example, may not achieve its main objective results – or may not be sustainable in the long run – if not taking distribution into consideration.

Hence, income inequality has to be considered when promoting a structural change that increases a country's growth rate consistent with balance-of-payments equilibrium.

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A CES Data Adjustments

Aguiar and Bils 2015 are worried about measurement errors in the survey. Hence, they conduct several corrections on the before tax and after-tax income, to make them match the National Income and Product Accounts (NIPA) definitions, which I followed here. The motivation for doing such corrections is similar to Cynamon and Fazzari 2017: the authors recognize that consumer expenditure surveys, with micro data, end up giving different results for total expenditures, when compared to the NIPA macro data. However, different from

Cynamon and Fazzari 2017, Aguiar and Bils 2015 adjust the variables from the Consumer Expenditure Survey to make them closer to NIPA variables – they consider imputed rent as part of housing expenditure, for example and, to be consistent, also add that value to the total income measure. The corrections that they do are described below:

> The income variables we examine are total household labor earnings, total household income before tax, and total household income after tax. These variables are principally based on responses in the last quarterly interview that cover income from the previous 12 months. Household labor income sums all household member earnings, before deductions, over the past 12 months. The before-tax income in the CE (FINCBTAX) includes labor earnings, business (including farm), and professional income, interest, dividend, rental, and royalty income, income from social security and railroad retirement benefits, income from pensions and annuities, scholarships or stipends, workers' compensation and veterans' benefits, and alimony and child support received. It also includes the following transfer payments: public assistance (welfare) payments including those related to job training, food stamps, supplemental security income, and unemployment benefits. We adjust this measure of before-tax income in the following ways to be consistent with budget accounting. We add in food as pay and other money receipts. The latter includes lump-sum receipts of alimony and child support, lump-sum receipts from estates, selling household items, prizes or gambling winnings, and refunds of insurance payments, property taxes, or employer over withholding on social security taxes. We subtract alimony and child support payments, to be consistent with those receipts being treated as income. We also subtract expenditures that we do not treat as consumption. These include life insurance premiums, occupational expenses, fees for financial services, finance charges, legal fees, funeral expenses, moving expenses, and support for college students. We treat the implicit rental from owner-occupied housing both as a component of expenditures and a part of income. So we add home owner's estimate of rental equivalence to before-tax income. At the same time we subtract expenses of home ownership for mortgage interest, property taxes, expenditures for capital repairs and replacements, home insurance, security systems, pest control, and other maintenance expenses both from income and expenditures. We subtract personal taxes from our measure of before-tax income to arrive at a measure of after-tax income. These taxes include federal, state and local income taxes. We also 1 subtract the income contributed to social security by all household members during the year, as well as contributions for government or railroad retirement programs. The CE measure of social security contributions is estimated by the BLS. Our measure of after-tax income differs from the CE measure (FINCATAX) due to all the adjustments listed above to before-tax income, and because we subtract contributions to social security, government, and railroad retirement programs. (Aguiar and Bils 2015, data appendix).

They also impose several sample restrictions on the sample: exclude non-urban house-

holds (the initial surveys were conducted only in urban regions), households that haven't participated in all 4 surveys, households that have implausibly large spending on smaller goods categories and, in order to eliminate outliers and to mitigate the impact of time-varying top coding, they exclude households in the top and bottom five percent of the before-tax income distribution. Hence, they are left with a total of 62,734 households for the years of 1980-2010.

The real after-tax income and quantity of households left in the sample in each decile by year is described on the tables A1 and A2 below.

Table A1: Average real after-tax income in each decile by year

Year	1	2	3	4	5	6	7	8	9	10	Total
1980	6,642	10,043	13,658	17,562	20,896	24,321	28,032	32,399	38,573	50,120	23,732
1981	7,253	10,628	14,315	17,637	20,660	23,601	26,944	31,152	37,995	47,734	23,368
1982	7,527	11,003	14,525	17,592	20,659	23,915	27,427	32,136	39,898	51,806	24,073
1983	7,018	10,213	13,727	16,994	19,986	23,172	27,328	32,599	39,794	51,047	23,637
1984	6,986	10,333	13,802	17,342	20,773	24,484	28,769	33,706	41,557	55,018	24,630
1985	7,128	10,074	13,572	17,361	21,257	24,878	29,335	35,012	44,057	57,454	25,306
1986	7,017	10,138	14,454	18,670	22,594	26,520	31,069	36,827	44,984	57,117	26,340
1987	6,600	9,740	13,517	17,199	20,883	25,115	29,838	35,467	44,017	58,239	25,343
1988	6,745	10,287	14,404	18,076	21,719	25,663	30,266	35,575	43,973	57,787	25,790
1989	7,110	10,757	14,754	18,785	22,381	26,298	30,833	36,848	45,483	59,450	26,591
1990	7,334	10,841	14,603	18,265	21,988	25,999	30,829	36,381	44,188	57,912	26,191
1991	7,393	10,968	14,750	18,322	22,107	26,136	30,564	36,246	44,021	56,783	26,124
1992	6,528	9,848	13,655	17,250	21,299	25,727	30,256	35,777	44,338	59,110	25,653
1993	6,537	9,903	13,482	17,189	21,206	24,931	29,697	35,776	44,090	56,799	25,317
1994	6,713	9,866	13,652	17,195	20,570	24,545	28,967	34,555	42,505	55,015	24,734
1995	7,206	10,602	14,166	17,683	21,631	25,949	30,576	35,948	43,833	55,384	25,734
1996	6,383	9,461	13,565	17,367	21,217	25,598	30,504	36,229	44,911	58,279	25,666
1997	6,902	10,211	14,204	18,305	22,481	26,765	31,248	36,878	46,223	59,284	26,589
1998	7,010	10,289	13,968	17,632	21,528	26,336	31,476	37,534	46,077	60,553	26,500
1999	6,906	10,372	14,916	19,047	23,150	27,984	33,585	39,892	49,564	65,742	28,305
2000	7,701	11,091	15,039	18,695	23,085	27,693	32,791	39,672	48,804	63,095	28,018
2001	7,888	11,643	15,849	20,057	24,193	28,827	34,005	41,053	50,427	66,157	29,219
2002	8,003	11,713	16,425	20,700	25,508	30,434	36,357	43,320	55,302	73,653	31,161
2003	7,718	11,423	15,761	19,926	24,668	29,799	35,434	42,874	53,403	68,725	30,156
2004	7,367	11,300	15,773	20,504	25,101	30,270	36,165	43,457	54,834	71,593	30,751
2005	7,227	10,929	15,411	19,988	24,747	29,690	36,144	43,965	57,364	77,829	31,169
2006	8,043	11,854	16,348	20,843	25,536	30,692	36,426	43,577	54,960	72,146	31,136
2007	7,329	10,669	15,191	19,288	23,964	29,135	35,172	43,154	55,655	72,969	30,254
2008	7,528	11,295	15,431	19,452	24,145	29,621	35,606	43,300	55,225	73,527	30,502
2009	7,129	11,022	15,281	19,017	23,284	28,788	34,972	43,656	55,373	73,492	30,179
2010	7,133	10,768	14,984	19,081	23,481	28,739	34,625	41,775	54,498	71,674	29,696
Average Growth	0,41%	0,37%	0,39%	0,36%	0,46%	0,62%	0,75%	0,89%	1,21%	1,31%	0,79%

Table A2: Quantity of households in each decile, by year

Year	1	2	3	4	5	6	7	8	9	10	Total
1980	39	76	77	76	77	77	76	77	76	38	689
1981	96	192	192	191	192	192	191	192	192	95	1725
1982	76	152	152	151	152	152	151	152	152	75	1365
1983	105	210	210	209	210	210	209	210	210	104	1887
1984	111	221	220	221	221	221	221	220	221	110	1987
1985	109	217	218	217	217	218	217	217	218	108	1956
1986	47	92	93	92	93	93	92	93	92	46	833
1987	115	229	229	229	229	230	229	229	229	114	2062
1988	104	207	206	207	207	207	207	206	207	103	1861
1989	111	220	221	220	220	221	220	221	220	110	1984
1990	109	218	218	218	218	218	218	218	218	109	1962
1991	108	214	214	214	214	215	214	214	214	107	1928
1992	110	218	218	218	218	219	218	218	218	109	1964
1993	111	220	220	220	220	220	220	220	220	110	1981
1994	110	218	219	218	219	219	218	219	218	109	1967
1995	100	198	199	199	198	199	199	198	199	99	1788
1996	58	115	115	115	114	115	115	115	115	57	1034
1997	106	211	211	211	210	211	211	211	211	105	1898
1998	104	207	206	207	207	207	207	206	207	103	1861
1999	115	228	228	228	228	228	228	228	228	114	2053
2000	140	280	280	280	279	280	280	280	280	139	2518
2001	148	296	296	295	296	296	295	296	296	147	2661
2002	150	300	300	300	300	300	300	300	300	149	2699
2003	162	324	324	324	323	324	324	324	324	161	2914
2004	144	288	288	287	288	288	287	288	288	143	2589
2005	81	162	162	162	161	162	162	162	162	80	1456
2006	152	303	303	303	303	303	303	303	303	151	2727
2007	148	295	295	295	294	295	295	295	295	147	2654
2008	143	284	284	284	284	284	284	284	284	142	2557
2009	146	290	291	290	290	291	290	291	290	145	2614
2010	143	284	285	284	284	285	284	285	284	142	2560
Total	3501	6969	6974	6965	6966	6980	6965	6972	6971	3471	62734

B Income Elasticities Estimations

B.1 Alternative Estimations for years 1994-1996

Table B1: Income elasticities by decile – estimation for 1994-96, IV expenditure with income category and log income

Category	01	02	03	04	05	06	07	08	09	10	Total
Alcoholic beverages	5,03	0,32	1,41	0,86	2,47	1,1	2,29	4,27	3,4	3,48	1,14
All other transportation	0,71	0,88	1,41	0,45	0,87	0,59	1,1	1,97	1,32	7,79	0,89
Appliances, phones, computers with associated services	1,58	0,37	1,21	0,67	0,73	2,27	0,84	1,09	1,29	-1,91	0,87
Cash contributions (not for alimony/support)	-0,19	-0,01	0,11	1,91	2,11	4,32	0,71	0,4	0,25	10,65	1,81
Children's clothing (up to age 15)	1,27	0,12	0,2	1,71	-0,1	-0,02	1,58	0,55	0,73	2,79	0,67
Domestic services and childcare	-0,17	-0,31	4,75	2,21	-1,35	1,9	4,48	2,5	0,74	5,83	1,6
Education	-0,48	1,88	1,34	1,89	0,11	2,41	-0,46	2,12	5,52	-7,59	1,63
Entertainment equipment and subscription television	1,21	0,52	3,7	0,74	0,73	1	1,87	1,98	2,57	-4,81	1,26
Entertainment fees, admissions, reading	2,87	0,38	4,61	1,7	0,81	1,64	5,89	4,02	2,62	8,92	1,74
Food at Home	0,47	0,33	0,22	0,39	0,44	0,37	1,18	0,33	0,62	2,4	0,37
Food away from home	1,08	0,41	2,14	1,19	0,66	2,9	1,87	2,29	1,8	3,2	1,33
Furniture and fixtures	-0,34	0,44	0,02	2,21	0,64	4,36	1,46	2,96	2,17	3,88	1,39
Health expenditures including insurance	-0,3	0,55	1,92	1,02	0,02	1	0,77	1,47	0,13	-2,39	0,91
Housing	1,26	0,73	1,45	1,08	1,18	1,17	1,7	1,22	1,39	0,79	0,92
Men's and women's clothing	0,99	0,73	2,25	1,41	1,6	2,01	3,28	2,62	2,3	0,8	1,35
Personal Care	0,78	0,83	2,17	1,03	1,82	1,29	2,58	1,86	2,3	0,02	0,96
Shoes and other apparel	1,25	0,88	0,62	0,68	0,92	2,05	3,93	2,97	0,56	-2,48	1,1
Tobacco, other smoking	-0,53	-1,62	-1,25	-0,79	-0,6	-0,36	1,29	-0,91	-3,13	1,22	-0,26
Utilities	-0,01	0,1	0,88	0,04	0,83	0,2	0,32	0,35	0,32	-2,65	0,47
Vehicle purchasing, leasing, insurance	0,3	1,66	0,88	0,67	2,02	-0,04	-1,61	1,33	2,04	0,54	1,02

Table B2: Income Elasticities by Decile – average between 1994-1996, dependent variable in log-linear

Category	1	2	3	4	5	6	7	8	9	10	Total
Alcoholic beverages	0,88	0,51	0,42	0,56	1,03	0,72	0,52	1,03	0,93	1,38	0,85
All other transportation	1,30	1,04	0,98	0,60	0,73	0,86	0,71	0,77	0,74	0,78	0,97
Appliances, phones, computers with associated services	0,98	0,92	0,84	1,01	0,72	0,86	0,99	0,64	0,83	0,82	0,90
Cash contributions (not for alimony/support)	0,51	1,35	0,96	1,38	0,90	1,65	0,65	0,57	0,67	2,12	1,27
Children's clothing (up to age 15)	0,47	0,49	0,87	0,73	0,28	0,18	0,09	0,69	1,16	0,64	0,57
Domestic services and childcare	1,52	1,43	2,04	1,91	0,81	1,50	0,86	1,44	1,37	2,05	1,55
Education	1,61	1,23	1,01	0,80	1,23	1,82	1,47	0,46	1,44	2,35	1,42
Entertainment equipment and subscription television	1,22	1,17	1,27	1,23	1,13	1,22	0,83	0,92	1,07	1,20	1,24
Entertainment fees, admissions, reading	1,53	1,84	1,39	1,53	1,34	1,45	1,35	1,31	1,11	1,56	1,79
Food at Home	0,47	0,35	0,37	0,38	0,48	0,52	0,45	0,38	0,41	0,46	0,40
Food away from home	1,40	1,20	1,26	1,17	1,06	1,05	0,98	0,94	0,99	1,13	1,35
Furniture and fixtures	1,04	1,25	1,40	1,19	1,16	1,21	1,38	1,25	1,27	1,02	1,34
Health expenditures including insurance	1,19	1,32	1,10	0,99	1,11	1,08	0,78	1,17	0,69	1,07	1,09
Housing	0,71	0,80	0,54	0,70	0,62	0,58	0,65	0,57	0,63	0,68	0,79
Men's and women's clothing	1,26	0,87	1,00	1,28	1,02	1,19	1,42	1,22	1,24	1,52	1,40
Personal Care	1,39	0,37	0,69	0,59	0,58	0,84	0,70	0,80	0,72	0,71	0,86
Shoes and other apparel	0,92	0,58	0,67	0,97	0,85	1,19	1,10	1,30	1,18	1,19	1,04
Tobacco, other smoking	0,57	0,17	0,16	0,06	-0,10	0,33	-0,25	0,34	-0,14	-0,11	0,08
Utilities	0,57	0,51	0,54	0,45	0,49	0,34	0,31	0,34	0,43	0,30	0,47
Vehicle purchasing, leasing, insurance	2,12	1,91	2,52	2,18	2,56	2,25	2,43	2,33	2,00	2,12	1,90

Table B3: Income Elasticities by Quintiles – average between 1994-1996, dependent variable: percentage deviation from average expenditure

Category	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
Alcoholic beverages	0,79	0,40	0,34	0,68	0,63	0,94	0,54	0,74	0,62	1,09	0,92	0,79	0,85	0,83	1,84	1,76	1,13	2,21	0,97
All other transportation	0,49	0,48	0,62	1,00	0,71	0,39	0,57	0,73	0,82	0,93	0,87	0,81	0,96	1,00	1,28	1,11	1,35	1,07	0,84
Appliances, phones, computers with associated services	0,46	0,57	0,59	0,59	0,69	0,69	0,92	0,65	0,48	0,88	0,83	0,91	1,06	0,71	0,69	1,35	1,44	1,13	0,82
Cash contributions (not for alimony/support)	0,14	0,74	0,66	0,61	0,79	0,60	1,25	0,16	1,20	1,44	1,82	0,83	1,04	2,02	0,74	1,49	2,29	4,35	1,43
Children's clothing (up to age 15)	0,28	0,32	0,63	0,33	0,63	0,64	0,91	0,40	0,39	0,89	0,16	0,40	0,29	1,22	0,72	1,11	2,60	1,53	0,69
Domestic services and childcare	0,29	0,76	0,84	1,19	0,94	1,41	1,57	0,70	1,12	1,68	1,27	1,62	0,02	1,27	2,07	1,05	2,42	5,65	1,45
Education	0,26	0,57	0,60	0,72	1,17	0,36	0,56	1,25	1,01	2,31	1,47	2,63	2,37	2,09	1,60	2,54	3,68	7,73	1,62
Entertainment equipment and subscription television	0,43	0,52	0,65	0,84	0,89	0,79	0,73	1,03	0,95	1,22	0,91	0,73	1,20	1,20	1,39	1,88	1,80	1,72	1,08
Entertainment fees, admissions, reading	0,58	0,66	0,68	0,70	0,78	0,79	0,89	1,18	1,23	1,32	1,23	1,11	2,04	1,69	1,83	1,80	2,17	2,17	1,40
Food at Home	0,35	0,36	0,20	0,29	0,44	0,38	0,32	0,55	0,41	0,50	0,51	0,44	0,54	0,40	0,51	0,29	0,56	0,59	0,40
Food away from home	0,49	0,40	0,56	0,76	0,97	0,80	0,83	0,78	1,06	1,44	1,09	1,71	1,06	0,77	1,48	2,01	1,41	2,14	1,16
Furniture and fixtures	0,62	0,84	1,15	0,61	1,96	0,61	0,81	0,92	0,63	1,42	1,40	1,73	2,06	2,07	1,71	2,80	3,06	0,66	1,37
Health expenditures including insurance	0,61	0,83	0,74	0,83	0,84	0,75	1,19	1,01	0,90	1,51	0,84	0,90	0,99	1,44	1,52	1,30	0,89	1,16	0,94
Housing	0,44	0,52	0,61	0,47	0,46	0,56	0,58	0,55	0,74	0,55	0,66	0,70	0,58	0,66	0,82	0,89	0,79	1,12	0,75
Men's and women's clothing	0,50	0,43	0,47	0,61	1,07	0,71	0,81	1,03	0,79	1,25	1,33	1,46	1,50	1,46	1,59	1,66	1,82	2,38	1,18
Personal Care	0,67	0,32	0,21	0,36	0,94	0,45	0,48	0,54	0,20	0,89	0,50	1,00	0,90	0,82	1,25	0,91	1,05	1,40	0,80
Shoes and other apparel	0,42	0,39	1,16	0,42	0,68	0,45	0,75	0,78	0,81	1,18	1,09	0,98	1,55	1,17	1,83	1,30	2,72	2,10	1,06
Tobacco, other smoking	0,67	0,70	-0,37	-0,15	0,18	0,35	0,34	-0,56	0,05	0,07	0,03	-0,65	0,40	0,94	0,41	-0,61	-0,20	0,27	0,00
Utilities	0,38	0,44	0,42	0,48	0,56	0,55	0,39	0,29	0,42	0,32	0,35	0,18	0,39	0,45	0,39	0,49	0,54	0,49	0,44
Vehicle purchasing, leasing, insurance	1,13	0,97	1,96	2,08	2,12	2,04	2,21	2,69	2,46	2,05	2,62	3,04	3,08	4,13	2,94	3,33	3,56	2,85	1,83

B.2 Income elasticity estimations for 1994-2010

Figure 1: Income Elasticities for 5-10 lower percentile of income distribution – OLS estimation using equation 12

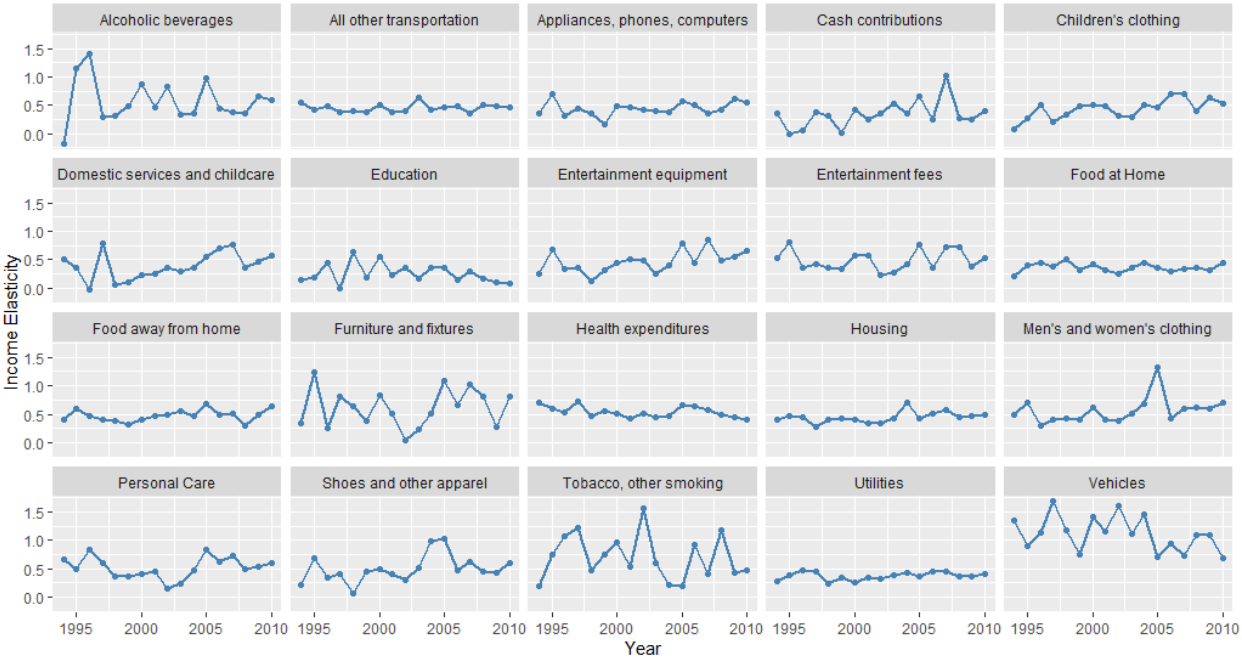

Figure 2: Income Elasticities for second lower decile of income distribution – OLS estimation using equation 12

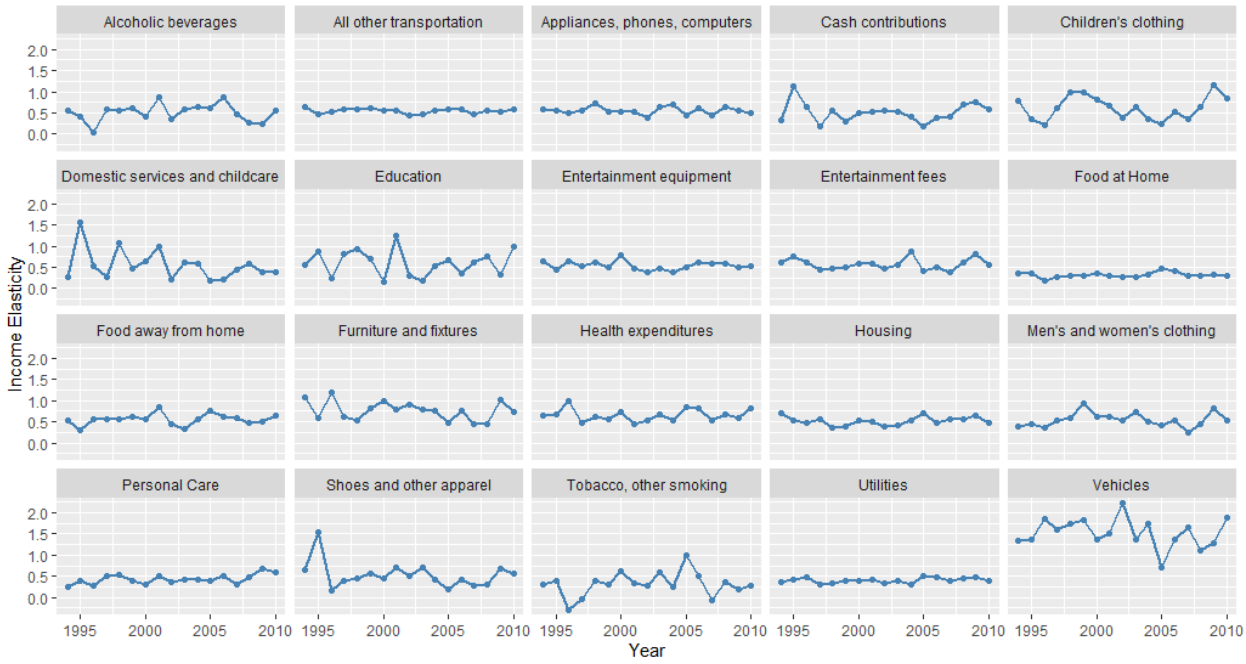

Figure 3: Income Elasticities for fifth decile of income distribution – OLS estimation using equation 12

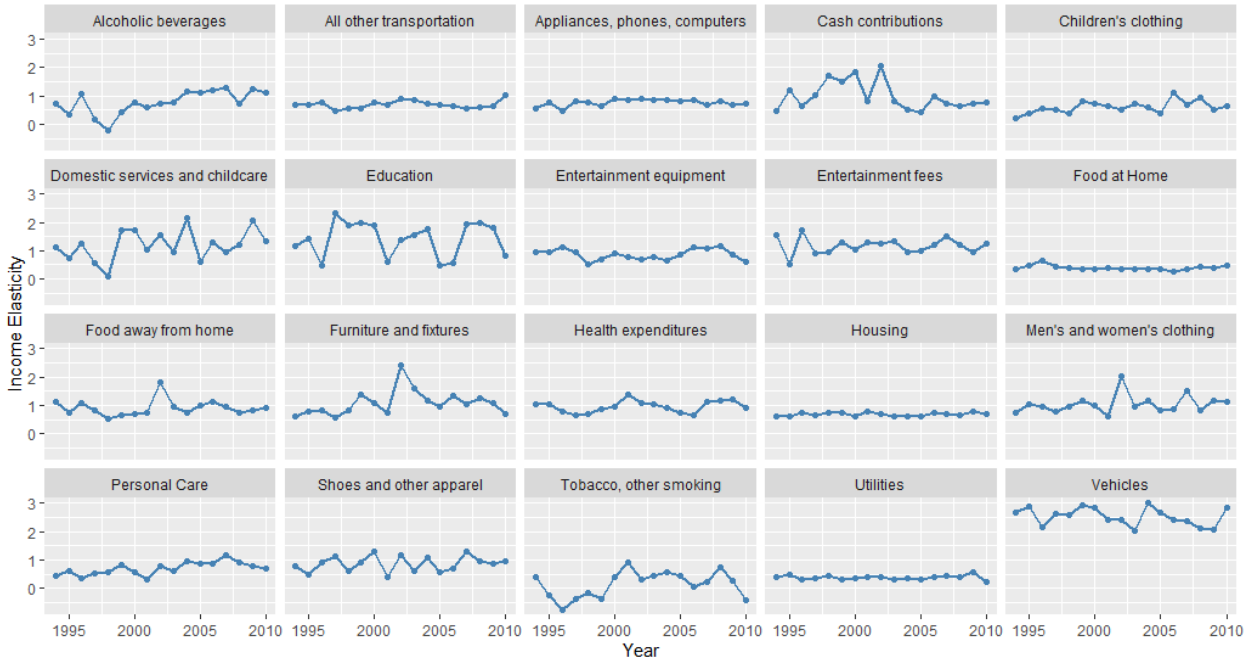

Figure 4: Income Elasticities for eith decile of income distribution – OLS estimation using equation 12

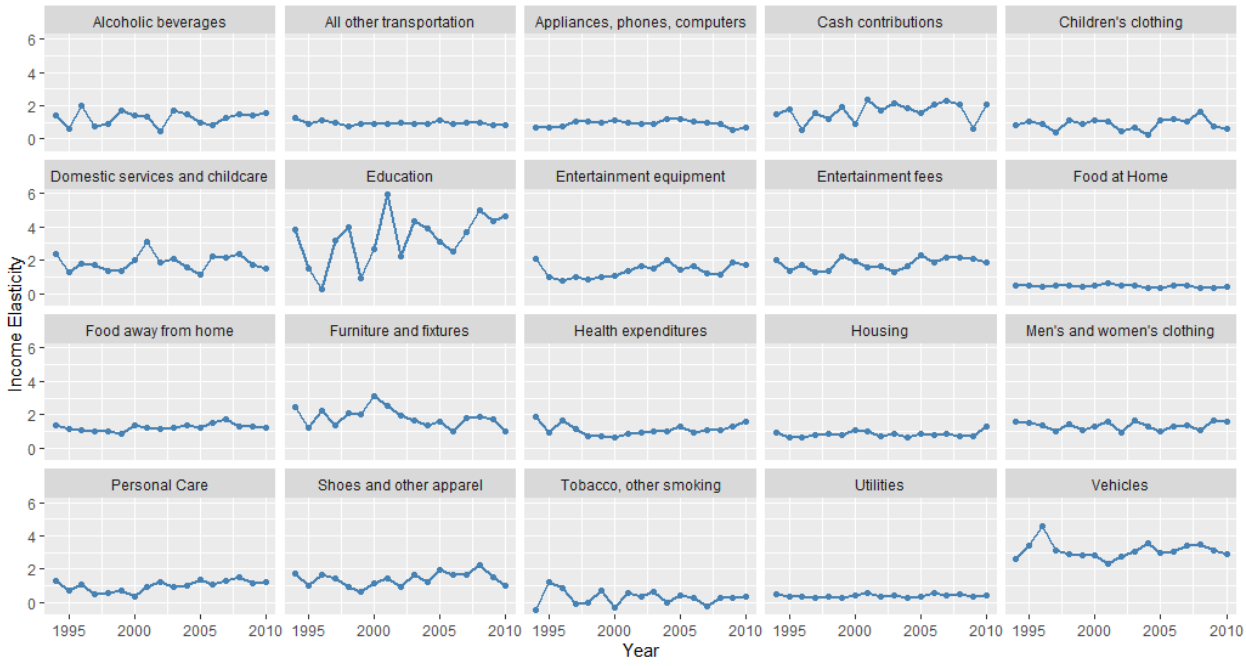

Figure 5: Income Elasticities for ninth decile of income distribution – OLS estimation using equation 12

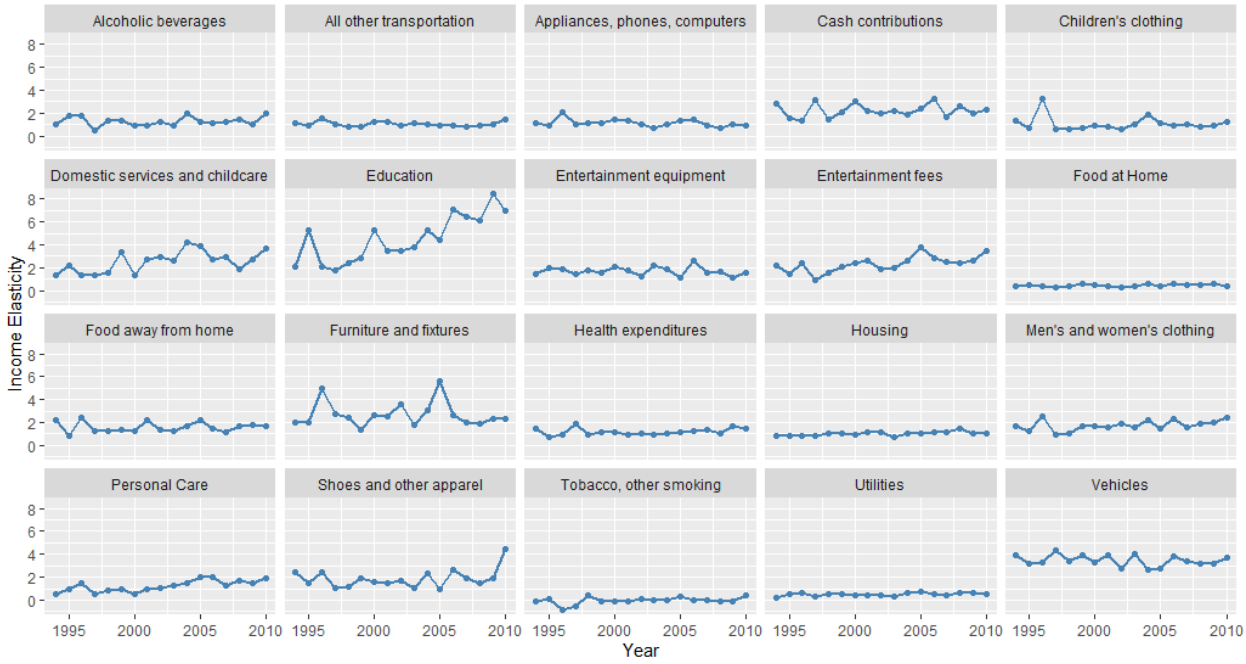

Figure 6: Income Elasticities for top 90-95 percentiles of income distribution – OLS estimation using equation 12