The Welfare Consequences of Income-Induced Expenditure Switching

By Rudolfs Bems and Julian di Giovanni*

The Great Financial Crisis led to a reversal of external imbalances in the European periphery countries (the so-called GIIPS), as well as in the Baltic states (Estonia, Latvia, and Lithuania). One crucial difference underlying the experiences of these countries relative to previous sudden stop episodes was the lack of exchange rate flexibility – in the case of the GIIPS, the euro bound these countries hands, while the Baltic states chose to maintain currency pegs to the euro throughout the crisis. Therefore, in contrast to large devaluation episodes, price adjustments played a limited role in external adjustment. Instead, these reversals were mainly driven via a fall in countries' incomes and the resulting contractions in imports (e.g., see Kang and Shambaugh, 2014; Eichenbaum, Rebelo and de Resende, 2016).

In Bems and di Giovanni (2016), we exploit a unique scanner-level dataset for a major Latvian retailer to study expenditure switching at the micro level over the 2006–11 period. We show that the income collapse during the 2008–09 crisis impacted adjustment via two channels: (i) a proportional reduction in imports, and (ii) *income-induced expenditure switching* (IIES henceforth). While channel (i) is standard, the focus on channel (ii) is novel in that we allow for non-homothetic preferences in consumers' consumption demand. This channel allows consumers to substitute towards lower priced goods given a fall in income. If lower priced goods in turn tend to be domestic rather than foreign (as is the case in Latvia and other emerging markets), consumers will disproportionately switch their consumption from foreign goods to domestic substitutes in face of an income contraction during crises.

This paper studies the welfare implications of IIES. More specifically, we quantify the reduction in welfare costs of a given external sector rebalancing that IIES provides. To do so, we employ the demand system framework of Hallak (2006), which motivates our previous work and was estimated in Bems and di Giovanni (2016). We calibrate a shock to aggregate expenditures that replicates the fall in imports, as observed in the data, and study its welfare implications under both homothetic and nonhomothetic preferences. As an alternative approach to gauge the importance of the IIES channel, we also perform a historical decomposition of the fall in imports, which allows us to compare the contribution of IIES to that of a conventional price-induced expenditure switching.

We find that IIES reduces the welfare costs of the external rebalancing by between 12–17%. In line with the existing literature, the historical decomposition shows that income compression was the main driver of the fall in imports, accounting for 68% of their decline. At the same time, the contribution of IIES (18%) was sizable and somewhat larger than that of conventional expenditure switching (14%).

The remainder of the paper presents a sketch of our theoretical framework, briefly describes the data and parameter values, and then explains the setup and results of the welfare calculations and historical decompositions.

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Theoretical Framework

Given nominal income and item prices, a representative consumer solves an expenditure allocation problem. Consumer's utility is defined over G product groups with the familiar CES aggregator:

$$C = \left(\sum_g \omega_g^{\frac{1}{\rho}} c_g^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}}. \tag{1}$$

Within each product group g, consumer chooses between a group-specific set of items, $\{c_{ig}\}_{i=1,\ldots,N_g}$:

$$c_g = \left[\sum_i \chi_{ig}^{\frac{1}{\sigma_g}} \left(\theta_{ig}^{\lambda_g(C)} c_{ig} \right)^{\frac{\sigma_g-1}{\sigma_g}} \right]^{\frac{\sigma_g}{\sigma_g-1}}, \tag{2}$$

where c_{ig} is measured in common physical units (e.g., KG or L), and θ_{ig} is a factor that converts these physical units into 'utils' and captures quality differences. We allow θ_{ig} to vary with income (linked via real consumption, C), so that the degree to which a "quality difference" within a product group matters is an increasing function of income. Specifically, $\lambda_g(C)$ captures the consumer's intensity for demand of an item's "quality" in a given group g. For this exercise, we set $\lambda_g = \mu_g \ln(C/C^0)$, where C^0 is pre-crisis steady-state consumption and $\mu_g > 0$ varies across product groups. The model also allows for the elasticity of substitution between items within a group, σ_g, to vary by product group. Finally, the budget constraint is $\sum_g \sum_i p_{ig} c_{ig} = PC = E$, where E is nominal income and is taken to be exogenous, while P is the aggregate price index of one unit of total consumption C:

$$P = \left[\sum_g \omega_g P_g^{1-\rho} \right]^{\frac{1}{1-\rho}},$$

$$P_g = \left[\sum_i \chi_{ig} \left(\frac{1}{\theta_{ig}^{\lambda_g(C)}} p_{ig} \right)^{1-\sigma_g} \right]^{\frac{1}{1-\sigma_g}},$$

where P_g is the product group price level. When solving the framework, it is assumed that the consumer takes the aggregate price level as given when choosing consumption quantities.

The quantitative exercises below are performed by focusing on the indirect utility function, $V \equiv E/P$, whereby to study an exogenous income fall, we "shock" E, and solve for new values of the price index, P, and welfare, V.

Data and Parameter Values

This paper uses a scanner-level dataset for Latvia that covers the 2008–09 crisis episode. The dataset includes the quantity of items purchased, transaction prices and indicates if a good is of domestic or foreign origin. The data are aggregated at the monthly frequency, cover 387 narrowly defined product groups with over 35,000 items, and is representative of aggregate food and beverages expenditures in Latvia.

Model parameters are either estimated or are chosen to be consistent with the Latvian scanner data. Furthermore, regression-based parameters are estimated while controlling for product group×time and item-level fixed effects.[1] To deal with variation in the precision of the estimated group-specific coefficients, our baseline results use parameter values calculated as weighted-average of the product groups' estimated coefficients, with weights based on groups' share of total expenditures over the sample period. Given this weighting scheme we obtain values of $\bar{\sigma}_g = 3.95$ and $\bar{\mu}_g = 0.58$. The elasticity of substitution across product groups, ρ, was estimated to be 2.24. Due to the differing degrees of aggregation $\rho < \bar{\sigma}_g$, as expected.

The values of the "quality parameter," θ_{ig}, are based on relative unit value differentials within product groups over the 2006–11 period. We combine the model's optimality conditions (at $t = 0$) with data on item prices and quantities to back out share parameters for (i) product groups, ω_g, and (ii) items within each group, χ_{ig}.[2] The

[1] Please see Online Appendix in Bems and di Giovanni (2016) for exhaustive detail on the dataset and estimation strategy.

[2] Note that we cannot normalize all prices to unity at $t = 0$, since price level differences matter for IIES.

remaining exogenous model inputs — item prices and nominal income — are taken directly from the data.

Scenario I: Matching Observed External Rebalancing

Our welfare calculations are based on a one-time shock between the pre-Great Financial Crisis ($t = 0$, defined as 2008Q4) and the post-Great Financial Crisis ($t = 1$, defined as 2009Q4) periods. We calibrate a shock to nominal income ($E^1 < E^0$) to match the "sudden stop" episode, and specifically to generate the observed contraction in Latvian imports:

$$\frac{\sum_g \sum_{i \in M} p_{ig}^0 c_{ig}^1}{\sum_g \sum_{i \in M} p_{ig}^0 c_{ig}^0} = \left(\frac{M^1}{M^0}\right)_{\text{data}},$$

where $i \in M$ captures imported items in each product group. We calculate this targeted fall in imports in data to be $\ln(M^1/M^0) = -0.3890$.

We then quantify welfare with the IIES channel present or not, as captured by $V^1(\mu > 0)$ versus $V^1(\mu = 0)$. To isolate the income effect, our baseline estimate keeps prices fixed at their pre-shock levels, $p_{ig}^1 = p_{ig}^0$. To help simplify the exercise, we do not consider the possibility of items entering or exiting the consumption basket, which we can justify from our previous work that shows that the extensive margin played a limited role in explaining overall expenditure switching in Latvia during the crisis. We implement the exercise using quarterly growth rates and sum over the four consecutive quarters to calculate the total impact on welfare over the crisis.

Table 1 presents the welfare results for our calibration under two cases. Column (1) presents results for homothetic preferences ($\mu = 0$), where, as expected, changes in nominal expenditures and welfare are proportional to the targeted changes in imports. Column (2) presents results for non-homothetic preferences ($\mu > 0$), which allow for the impact of IIES. Non-homothetic preferences introduce two sources for welfare deviations from the homothetic case. First, within product groups the fall in imports can exceed the fall in expenditures because of IIES, thus improving welfare for a given targeted fall in imports. Second, income changes can increase (decrease) the model-based aggregate price index, even if item prices stay fixed, thus decreasing (increasing) welfare. Our quantitative results show that this latter effect, working via the price index, is approximately zero and differences in welfare between the two cases are driven by the disproportionate fall in imports due to IIES. Overall, IIES reduces welfare losses by approximately 17% relative to the homothetic case in column (1).

[TABLE 1 HERE]

The minimal impact on the aggregate model-based price index under IIES is intriguing. The intuition for this result is that after a negative expenditure shock, lower (higher) quality items become cheaper (more expensive) in quality-adjusted terms, $\widetilde{p}_{ig} \equiv \left(1/\theta_{ig}^{\mu_g \ln\left(C/C^0\right)}\right) p_{ig}$. On aggregate, these price adjustments approximately cancel out in our data. To see this effect for a typical product group, Figure 1 plots the quality-adjusted price level against the unit price level in period 1 for bottled beer, for both domestic and imported beer. Deviations from the 45-degree line in the figure represent income-induced changes in quality-adjusted item prices. The figure shows that prices of low/high price goods decrase/incrase further when expressed in quality-adjusted terms, thus generating IIES and imported items tend to have higher prices. At the same time, calculated price changes tend to cancel out on average, leaving a limited impact on the model-based price index for bottled beer.

[FIGURE 1 HERE]

Findings in Table 1 are robust to allowing for (i) heterogeneity in group-specific parameters, σ_g and μ_g, as estimated in Bems and di Giovanni (2016); (ii) year-on-year implementation of the exercise, with the extensive margin present; (iii) observed price changes, $p_{ig}^1 \neq p_{ig}^0$ as additional shocks; and

Instead, we used observed price levels and set pre-crisis income to unity, as described in the Framework section.

(iv) alternative definitions of the crisis year. For all these alternative specifications, IIES reduces welfare costs by between 12–17%.

Scenario II: Historical Decomposition Based on Observed Income and Price Changes

A complementary approach to gauge the importance of IIES is to compare it to conventional price-induced expenditure switching in terms of its impact on the fall in imports during the crisis. We next turn to examining this impact by allowing for both income and prices to adjust according to their observed values during the crisis in Table 2. We consider non-homothetic preferences in all cases. Column (1) begins by feeding in only the observed expenditure change over the crisis period. The impact from such a shock broadly replicates results in Column 2 of Table 1.

[TABLE 2 HERE]

Column (2) feeds in only the observed historical price changes, while keeping income constant. First, we see that these prices changes were in fact deflationary, and thus lead to a welfare *improvement* for consumers. However, as shown in our previous work, the aggregate price change, mainly driven by changes *across* product groups, explains only a fraction of the fall in imports, which took place mostly *within* product groups. This result explains the limited contraction in aggregate imports in the last row.

Column (3) allows for both observed income and price changes. Doing so still allows for aggregate price deflation, though marginal, offsetting the welfare loss from the fall in income, as one can see by comparing the welfare changes in columns (1) and (3). Total import contraction is 11% larger than what is observed in the data. We find that of the model-driven import contraction, 68% (0.29/0.43) can be attributed to income compression, 14% (0.06/0.43) to observed price changes and the remaining 18% to IIES.

Conclusion

Income-induced expenditure switching has been shown to matter in explaining external rebalancing under fixed exchange rates. In this paper we show that this rebalancing channel has non-trivial welfare consequences for consumers. Our estimates, based on the 2008-09 sudden stop episode in Latvia, suggest that IIES reduces welfare costs of external rebalancing by 12–17%.

We see this line of research as only a beginning. First, it would be interesting to extend our basic analysis to other countries and sectors to better understand how important IIES is in general. Second, our work has thus far only focused on the consumer/demand-side for one sector of the economy (albeit an important one). Future research studying the supply-side and the general equilibrium implications of IIES is needed.

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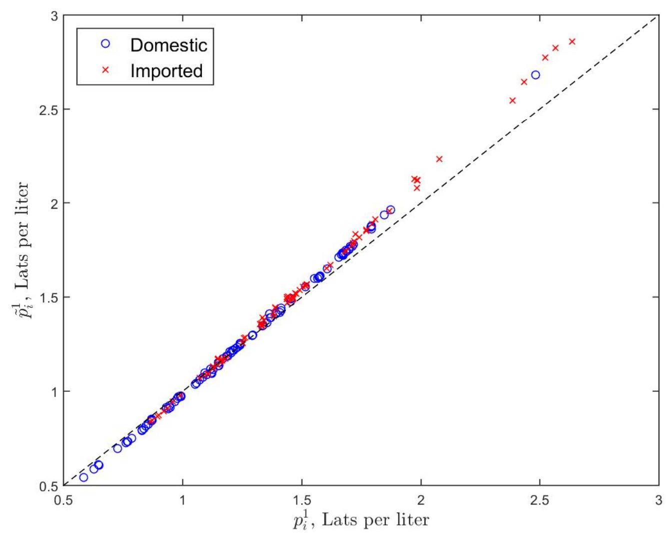
Table 1—Welfare Changes under an Expenditure Shock

	(1) $\Delta \ln E$ only	(2) $\Delta \ln E$ + IIES
$\Delta \ln E$	-0.3890	-0.3089
$\Delta \ln P$	0.0000	0.0122
$\Delta \ln V$	-0.3890	-0.3212

Note: This table presents welfare changes given a change in expenditures to matches the observed change in imports in the data, $\Delta \ln M_{\text{data}} = -0.3890$. Column (1) presents results for homothetic preferences, so that welfare changes proportionally with the expenditure change. Column (2) presents results for non-homothetic preferences, which allows for the impact of IIES.

Figure 1. Quality-Adjusted Prices in Period 1 for the Product Group "Bottled Beer"



Note: This figure plots the quality-adjusted price level, $\tilde{p}_{ig}^1$, against the unit price level, p_{ig}^1, in period 1 for bottled beer, for both domestic and imported beer. All bottled beer is prices in domestic currency (Lats) per liter. Deviations from the 45-degree line represent income-induced change sin quality-adjusted price levels between t=0 and t=1.

Table 2—Historical Decomposition of Changes in Imports

	(1) $\Delta \ln E_{\text{data}}$	(2) $\Delta \ln p_{ig,\text{data}}$	(3) $\Delta \ln E_{\text{data}} + \Delta \ln p_{ig,\text{data}}$	(4) Data
$\Delta \ln E$	-0.2936	0.0000	-0.2936	-0.2936
$\Delta \ln P$	0.0115	-0.0202	-0.0088	–
$\Delta \ln V$	-0.3052	0.0202	-0.2849	–
$\Delta \ln M$	-0.3737	-0.0595	-0.4335	-0.3890

Note: This table presents model-based changes in imports and welfare from observed changes in expenditures and prices in the data. Columns (1)-(3) presents results for non-homothetic preferences, given changes in (1) expenditure only, (2) price only, and (3) expenditure and prices, respectively. Column (4) presents moments from the data.