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## Measuring persistent effects of circumstances and inequality of opportunity using panel data

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# MEASURING PERSISTENT EFFECTS OF CIRCUMSTANCES AND INEQUALITY OF OPPORTUNITY USING PANEL DATA

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and Joseph Albert Nino Bulan*

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## ABSTRACT

In this paper, we make two contributions to the literature on inequality of opportunity (IOP). First, we use longitudinal data for two developing countries, Thailand and Viet Nam, to study the evolution of absolute and relative IOP in the income and consumption space over a 10-year period, thus adding to the relatively limited evidence on changes in IOP over time. Second, we propose and estimate “circumstance” elasticities as measures of the responsiveness of current income and consumption to pre-existing circumstances. Our analysis finds that inequalities of opportunity are enduring in both countries. We also find that the circumstance elasticities for the vast majority of household types identified by their baseline circumstances are not significantly different to unity and non-declining over time. Our evidence points to long-duration effects of circumstances on welfare outcomes.

**Keywords:** inequality of opportunity, circumstance elasticity

**JEL codes:** D31, D63, O15

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## 1. Introduction

High levels of inequality have been a long-standing albeit contentious subject of social and policy concern.<sup>1</sup> These concerns are ultimately grounded in varying notions of fairness and justice, and public and policy debates have centered on what may be considered an acceptable or tolerable level of inequality. Starting from the position that not all inequality is necessarily unfair, an important line of academic investigation has been concerned with identifying the inequality of opportunity (IOP) as the toxic or ethically reprehensible part of inequality. There is now a large and growing literature on estimating IOP; for instance, Bourguignon, Ferreira, and Menendez (2007); Ferreira and Gignoux (2011); Singh (2012); Brunori, Ferreira, and Peragine (2013); Niehues and Peichl (2014); Hufe et al. (2017); Brunori, Hufe, and Mahler (2018); Brunori, Palmisano, and Peragine (2019); Carranza (2020). A widely used methodology is the so-called *ex-ante* approach, which identifies IOP with inequality between “types,” where each *type* of individuals or households is distinguished by a set of circumstances deemed to be beyond their control. Outcome differences across circumstance-types, as they represent factors beyond individual responsibility, can thus be considered unfair, and deserve to be compensated.

There are a large number of applications of this approach to estimating IOP. However, for the most part, they have been limited to constructing IOP estimates cross-sectionally often at a single point in time, reflecting in part the limited availability of

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<sup>1</sup> Several studies have pointed to widening and high levels of inequalities in many countries and their detrimental consequences in terms of perpetuating vicious cycles of disadvantage, reduced social cohesion and increasing the likelihood of social conflict, as well as adoption of populist policies by governments with suboptimal economic outcomes (Martinez et al. 2017, Rodrik 2018, Piketty 2020). More recently, the coronavirus disease (COVID-19) pandemic is likely to have had a scarring impact on social mobility with estimates showing that students from the poorest wealth quintile are likely to incur losses of future earnings that are 47% higher than those from the richest quintile (Asian Development Bank [ADB] 2022).

longitudinal data. Nonetheless, as a result, this literature has not investigated dynamic or persistent effects of circumstances on outcomes of interest. Yet, an important insight from the related work on intergenerational mobility (for instance, Chetty et al. 2014, 2017, 2018, 2020; Narayan et al. 2018; Alesina et al. 2021; Asher, Novosad, and Rafkin 2022) is that circumstances can have long-term consequences.<sup>2</sup> It is thus of interest to inquire whether the effects of circumstances identified through IOP estimates at a given point in time persist in subsequent time periods.

This paper is an attempt to address this issue using longitudinal data for Thailand and Viet Nam. We use data from six waves of the Thailand Viet Nam Socio Economic Panel (TVSEP) spanning 2007 to 2017 to investigate how far the effects of base-year circumstances on household consumption and income persist through the six waves and thus influence the evolution of IOP over the decade-long period. This is done through the following steps. First, we use a set of base-year circumstances to estimate the base-year distribution of circumstance-specific (counterfactual) incomes across circumstance types and use that to determine base-year IOP. This first step is no different to what is typical of most IOP applications. In the following step, we proceed to estimate the relationship between the base-year circumstance-specific incomes and actual incomes in the second period to determine the second-period circumstance-specific incomes and the second-period IOP. From then on, the process is repeated for subsequent rounds of the data such that the estimated relationship between current incomes and the lagged distribution

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<sup>2</sup> Torche (2015) and Fox, Torche, and Waldfogel (2016) have a review of literature. van der Weide et al. (2021) and World Bank (2021) have information on the Global Database on Intergenerational Mobility (GDIM), which has intergenerational mobility estimates for 153 countries globally. However, the database tracks intergenerational mobility in terms of the years of schooling only. Intergenerational income mobility estimates are relatively less common for developing countries where the share of the informal sector in employment and incomes is high and there is a paucity of linked parent–child income data.

of circumstance-specific incomes is used to construct the current-period distribution of circumstance-specific incomes and the corresponding estimates of current-year IOP. The process also yields measures of the elasticity of current income to preceding period's circumstance-specific income for each household type (hereafter, circumstance elasticity of income). These are of particular interest as they offer us direct measures of the extent of persistence of circumstance effects over time.

Two main findings emerge from our analysis. First, the IOP estimates, though different from year to year, indicate a relatively high share of IOP in overall inequality over the decade-long period for both Thailand and Viet Nam. This generally holds for both real per capita consumption and income as the outcome variables. Second, the estimated circumstance elasticities of current consumption and income are not statistically different from unity for the vast majority of circumstance types. More importantly, there is no sign of an attenuation of these elasticities over time. We interpret these findings as strong evidence of the persistent effects of circumstances on income and consumption outcomes and the consequent IOP.

Our analysis makes both a methodological and an empirical contribution. While a large variety of point estimates of IOP are available in the literature for both developed and developing countries, our paper is the first of its kind to introduce a methodological framework to extend the IOP analysis to a dynamic setting so as to explore how effects of circumstances on IOP are passed on from one period to the next. Our analysis also introduces the useful metric of the circumstance elasticity of outcomes for each circumstance type to track the degree of persistence of circumstance effects over time. This overlaps with issues of economic mobility over time. The stability of the circumstance



elasticity for any given household type is demonstrative of the continuing hold of circumstances for that type and the ineffectiveness of economic mobility to break that hold. The time pattern of circumstance elasticities thus also offers a handy representation of economic mobility for different socioeconomic groups.

## 2. Methods

This paper employs the widely used *ex-ante* approach to measuring IOP, whereby IOP is identified as the inequality in the expected outcome of interest—in our case income or consumption—across different circumstance “types.”<sup>3</sup> Following the early formulation by Roemer (1993) and common practice in the empirical IOP literature, a type is identified as a subset of persons with the same circumstances (attributes deemed to be beyond individual control). IOP can thus be estimated as the between-types component of overall inequality, or equivalently as the inequality in the counterfactual distribution of income where the actual income of an individual is replaced by the expected income of their circumstance type.

Thus, based on a set of circumstance variables, a population of  $N$  individuals  $j = 1, \dots, N$  is mapped into mutually exclusive types  $k = 1, \dots, K$ , where each type  $k$  corresponds to a unique combination of circumstance variables. Then, corresponding to the distribution of actual incomes  $y_j$ , IOP is then defined as:

$$IOP = I(y_{jk}^c) \text{ where } y_{jk}^c = E(y_j | j \in k) \quad (1)$$

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<sup>3</sup> Ramos and Van de Gaer (2021) discuss alternative measures of IOP, including *ex-post*, direct, and indirect measures. *Ex-post* measures measure inequality across individuals who have the same level of effort. Empirical specification of individual effort can, however, be challenging.

$y_{jk}^c$  is the counterfactual circumstance-specific income of individual  $j$  of type  $k$  and  $I(\cdot)$  is an inequality measure defined on the relevant distribution. The share of IOP in overall income inequality, or what is referred to as relative IOP, is given by  $I(y_{jk}^c)/I(y_j)$ . We use a nonparametric approach to specifying counterfactual incomes as the mean income of each circumstance type.

This is fairly standard in the literature. The novelty of our application lies in extending it to a dynamic setting where the same individuals or households are observed at multiple points in time, thereby permitting an investigation of the persistence of IOP over time and the continuing hold of an initial set of circumstances. We do this as follows.

With longitudinal data on individual incomes  $y_{jt}$  observed over multiple time periods  $t = 0, 1, \dots, T$ , we use a set of base-year (and hence time invariant) circumstance variables to identify circumstance types and determine base-year counterfactual incomes by estimating an income model with a complete set of indicator variables  $C_k$  (with  $C_{jk} = 1$  if  $j \in k$ , 0 otherwise), representing all possible combinations of circumstance variables in the data:

$$\ln y_{j0} = \sum_k \beta_k^0 C_{jk} + \varepsilon_{j0} \quad (2)$$

Predictions from (2) yield base-year counterfactual log incomes and the corresponding absolute counterfactual incomes as  $y_{jk0}^c = \exp(\hat{\beta}_k^0 C_{jk} + \hat{\sigma}_\varepsilon^2/2)$ , which can be used to estimate base-year as  $IOP_0 = I(y_{jk0}^c)$ .

Note that  $y_{jk}^c$  takes  $K$  distinct values corresponding to each of the  $K$  circumstance types, and can be interpreted as the base-year *circumstance score* for each individual type in the income space. For the next time period 1, we take these base-year

circumstance scores or incomes to represent each type and estimate how they influence period 1 incomes, using:

$$\ln y_{j1} = \sum_k \eta_k^1 C_{jk} \ln y_{jk0}^c + \varepsilon_{j1} \quad (3)$$

Predictions from (3) provide us not only the counterfactual incomes for each type  $k$  in period 1 and hence a measure of IOP for period 1, they also provide us with estimates of  $\eta_k^1$ , the elasticities of period-1 incomes with respect to circumstance-determined incomes from the earlier period for each circumstance type.

This can be repeated for each subsequent time period  $t = 2, \dots, T$  using:

$$\ln y_{jt} = \sum_k \eta_k^t C_{jk} \ln y_{jkt-1}^c + \varepsilon_{jt} \quad (4)$$

The process thus yields not only IOP estimates for each time period, it also provides estimates of  $\eta_k^t$  for each type  $k$  and each of  $T - 1$  time periods. The estimated  $\eta_k^t$ 's, which, for expositional convenience we refer to as the circumstance elasticities of income, offer a useful metric of how responsive current incomes are to pre-existing circumstances. In a world of high economic mobility, we would expect these circumstance elasticities to be not significant. In a world of diminishing hold of circumstances on outcomes, we would expect the circumstance elasticities to decay over time. More generally, variations in  $\eta_k^t$ 's by type and over time are of significant potential interest in understanding the nature and degree of persistence in the effects of circumstances on income outcomes.

Note that one could also estimate the analogue of (1) directly for each of the subsequent time periods, resulting in a set of parameters  $\beta_k^t$ 's. These  $\beta$  parameters are however closely related to the circumstance elasticities  $\eta_k^t$ 's in (4). In particular,  $\beta_k^t =$

$\beta_k^{t-1}\eta_k^t$ , or equivalently,  $\eta_k^t = \beta_k^t/\beta_k^{t-1}$ . In other words, the “circumstance” elasticity is a measure of the innovation in  $\beta_k^t$ 's over time for any type  $k$ . Thus, whether  $\eta_k^t$ 's are greater, less than or equal to 1 is critical in assessing whether the influence of circumstances on outcomes attenuates over time or not. The main advantage of using  $\eta_k^t$ 's is their elasticity (unitless) representation, which makes them a comparable statistic not only across types and over time, but also a comparable statistic across countries.

### 3. Data

We use data from the Thailand and Viet Nam Socio Economic Panel (TVSEP) which contains longitudinal information on income, consumption and a wide range of socioeconomic variables for rural households across six provinces, three each for Thailand and Viet Nam. For our analysis, we use six waves of TVSEP for the years 2007, 2008, 2010, 2013, 2016, and 2017.<sup>4</sup>

Our two outcome variables are per capita consumption and per capita income at the household level, expressed in real terms using consumer price indices for each country. IOP estimates are sometimes based on individual incomes; however, the use of per capita or equivalized income or consumption as a measure of well-being is common in the literature, especially for developing countries (for instance, Ferriera and Gignoux 2011; Brunori, Palmisano, and Peragine 2019; Brunori, Peragine, and Serlenga 2019). In a rural developing country context, as for our dataset, it is typically not possible to attribute household income to individual members given the preponderance of self-

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<sup>4</sup> Details and documentation of the TVSEP data can be found at TVSEP. TVSEP Data. <https://www.tvsep.de/en/data>.

employment activities, especially farming. Attributing household consumption to individual members is difficult in most settings given the presence of household public goods as well as several non-assignable goods and services.

In the TVSEP dataset, both income and consumption data are not always available for all households. Hence, the size of the income panel differs from that of the consumption panel. For Thailand, the income panel comprise 1,405 households and the consumption panels comprise 1,770 households. The Viet Nam income and consumption panels have 1,381 and 1,708 households respectively.<sup>5</sup> Table 1 shows the index numbers for real mean per capita income and consumption for the six waves for the two countries. Over the 10-year period, mean income growth is faster than mean consumption growth for both countries. This is a period of significant growth for both Thailand and Viet Nam, although the pace of growth as an order of magnitude is higher in Viet Nam, with a doubling (near tripling) of mean consumption (income) by the end of the period.

For this study, we use six circumstance variables. All circumstance variables are baseline characteristics of the head of household for the year 2007. The baseline characteristics of the household head are time-invariant by construction, and as they are pre-determined for the initial year, they arguably represent factors that are beyond individual control for subsequent outcomes. The circumstance variables include:

- (i) the household head's gender;
- (ii) whether they belong to an ethnic minority (not Thai in case of Thailand and not Kinh for Viet Nam);

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<sup>5</sup> The income panels are limited to households with positive incomes.

- (iii) whether they have had a serious illness (during May 2006–April 2007) or they are underweight (with a body mass index below 18.5);
- (iv) their year of birth, a categorical variable distinguishing household heads born during 1972–1987, 1957–1971, 1942–1956, or before 1942;<sup>6</sup>
- (v) their province of residence, distinguishing the three provinces in Thailand (Buriam, Ubon Ratchathani, and Nakhon Panom) and in Viet Nam (Ha Tinh, Thua Thien Hue, and Dak Lak);<sup>7</sup> and
- (vi) their level of education, distinguishing five categories corresponding to less than primary, completed primary but less than lower secondary, completed lower secondary but less than upper secondary, completed upper secondary but less than tertiary, and tertiary and above.

Table 2 shows the profile of households by these circumstance characteristics. There are some differences across the two countries. Thailand has a higher proportion of female-headed households, although a lower proportion of household heads belong to ethnic minorities. Furthermore, household heads in Viet Nam tend to be younger and better educated, although a higher proportion of them are underweight or have a serious illness.

Working with these six base-year circumstance variables, three of which are categorical, it is possible to identify a large number of circumstance types in our data. In particular, all possible combinations of the circumstance variables identify 189 and 260

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<sup>6</sup> These categories, though somewhat arbitrary, were chosen so as to have reasonable densities across different birth cohorts.

<sup>7</sup> Note that the province of residence is a reasonable proxy for the province of birth as 75% and 86% of household heads in Thailand and Viet Nam respectively were born in the same province where they were living at the time of the survey.

different household types for Thailand and Viet Nam, respectively, for the consumption panel, and 173 and 248 types respectively for the income panel.<sup>8</sup> Since these are identified using base-year circumstances, a household's type by construction remains invariant over time. Indeed, the key objective of the exercise is to track the influence of base-year circumstance typology on the subsequent evolution of outcomes and IOP.

## 4. Results

### *4.1. Inequality of Opportunity over Time*

Following the methods outlined in section 2, we construct our IOP estimates using three inequality measures within the Generalized Entropy ( $GE(\alpha)$ ) class of inequality measures, which are appropriate for this purpose in light of their additive decomposability property (Shorrocks 1980). The three inequality measures we use are:  $GE(0)$  or the mean logarithmic deviation,  $GE(1)$  or the Theil index, and  $GE(2)$  or half of squared coefficient of variation.<sup>9</sup>

Tables 3 and 4 present the IOP results for per capita consumption for Thailand and Viet Nam for the six survey years from 2007 to 2017. For Thailand, the share of IOP in overall inequality, or relative IOP, are 17% to 19% for  $GE(0)$ , 16% to 22% for  $GE(1)$ , and 12% to 26% for  $GE(2)$ . The corresponding shares of IOP for Viet Nam are higher, 30% to 39% for  $GE(0)$ , 27% to 39% for  $GE(1)$ , and 20% to 34% for  $GE(2)$ . This reflects somewhat higher levels of IOP and lower levels of overall inequality in Viet Nam relative to Thailand. As for the time pattern, there seems to be a tendency of decline in the relative

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<sup>8</sup> To put this in international perspective, Brunori et al. (2013) survey of IOP estimates for 41 countries noted the number of types identified ranged from a low of six to a high of 7680.

<sup>9</sup> Higher values of  $\alpha$  attach greater weight to differences at the upper end of the distribution.

IOP up to 2010 (2013) for Thailand (Viet Nam) followed by an increase later. In general, with the exception of lower values for 2010 (2013), the relative IOP measures themselves seem to be relatively stable for both countries for the GE(0) and GE(1) measures, with some signs of decline for the GE(2) measure. Tables 5 and 6 report the IOP results for per capita incomes. Note that the inequality and IOP measures in these tables are computed subject to a 1% trim of the data to mitigate the effects of outliers at the top and bottom end of the distribution. The IOP results for income are similar to those for consumption, though with some notable differences. First, the levels of overall inequality and IOP for income are higher than those for consumption. This is similar to evidence from other countries and is consistent in households resorting to a measure of consumption smoothing through savings or borrowing. Second, relative to case of consumption, the shares of IOP in overall inequality for income are also higher, between 21% and 45% for Thailand and between 25% and 53% for Viet Nam. Third, while there is no evidence of a systematic trend in the share of income IOP for Thailand, the estimates for Viet Nam do suggest a decline over the 10-year period, reflecting a relatively larger decline in levels of IOP than in the levels of overall inequality.

Our estimates of relative IOP overlap with the range observed in the literature. For instance, the survey by Brunori et al. (2013) reported relative IOP estimates across 41 countries ranging from 2% for Norway to 34% for Guatemala. Similarly, Brunori et al. (2019) report relative IOP estimates for 10 sub-Saharan African countries ranging between 40% and 56%. However, comparisons across diverse estimates are difficult because of underlying differences in survey design, the outcome variables used, the set and the number of circumstance variables and types identified, and the use of parametric



or nonparametric methods. A more significant finding from our results is that with the exception of the Viet Nam income panel, the relative IOP estimates are fairly stable and do not exhibit a trend decline over the decade-long period. For Viet Nam, if consumption is taken to be a proxy for permanent income, a declining relative IOP in the income space together with its stability in the consumption space, suggests that the decline in income IOP is largely confined to the transitory component of income.

#### ***4.2. The Circumstance Elasticities***

Figures 1 to 4 depict the circumstance elasticities for Thailand and Viet Nam by type for each of the five non-base years: 2008, 2010, 2013, 2016, and 2017. Figures 1 and 2 show elasticities for consumption while Figures 3 and 4 show the same for income. The figures show the point estimates of elasticities together with their 95% confidence interval. In each figure, the types are sorted in increasing order of their 2008 circumstance elasticity; thus, the top panel for 2008 in each figure shows monotonically increasing point estimates of elasticities by type. The non-monotonic pattern of elasticities for subsequent years is indicative of substantial churning over time.

However, the most remarkable finding in relation to the circumstance elasticities is that they are not significantly different from 1 for the vast majority of circumstance types. Table 7 reports the percentage of types for whom the circumstance elasticities are statistically no different to unity for each of the 5 years. For consumption, this percentage ranges between 74% and 96% for Thailand, and between 74% and 93% for Viet Nam. The corresponding percentages are smaller for income, but they still range between 62% and 93% for Thailand and between 72% and 89% for Viet Nam. The unit circumstance elasticities imply that variations in the circumstance-specific income (consumption) for

most household types are equi-proportionally reflected in their actual income (consumption), indicative of the strong and persistent grip of circumstances on realized outcomes.

We also explored whether our estimates imply an attenuation of the circumstance elasticities over time. Mainly as a descriptive device, we looked into the possibility of within-type time trends in circumstance elasticities. The time trends were not significant for income, and positive and significant for consumption in either country. The estimated linear trends (and standard errors) were: 0.0015 (0.0012) and -0.0001 (0.0011) for the Thailand and Viet Nam income panels respectively; and 0.0015 (0.0005) and 0.0018 (0.0004) for the Thailand and Viet Nam consumption panels respectively.<sup>10</sup> Thus, there is no evidence of a decay in circumstance elasticities; on the contrary, for consumption, the evidence points to an upward trend over time.

### ***4.3. Robustness to Number of Types***

It is obvious that the share of IOP in overall inequality is increasing in the number of types (Ferreira and Gignoux 2011). Brunori, Peragine, and Serlenga (2019) argue that a larger number of types, while potentially reducing the downward bias due to omitted circumstances, may, however, introduce an upward bias by increasing the sampling variance of the counterfactual distribution of circumstance-specific outcomes. The main risk is overfitting: the improvement in the within-sample predictions with a larger number of types may come at the expense of poorer predictions out-of-sample. We explore this

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<sup>10</sup> Since these trends pertain to already estimated quantities, the standard errors should be treated as primarily indicative. As mentioned, we present this mainly as a summary description of trends in circumstance elasticities implied by our estimates.

issue by suppressing one of our circumstance variables to reduce the number of types identified.<sup>11</sup>

In particular, we exclude serious illness or underweight status of household head from our set of circumstance variables. We opt for the exclusion of this variable also in view of the possibility that serious illness or underweight status could have an element of “effort” or lifestyle choices as its determinant (Roemer and Trannoy 2015). The suppression of this variable reduces the number of types identified by 37% to 39% for Thailand and 41% to 42% for Viet Nam. The number of types decreases from 189 to 116 for the Thailand consumption panel, from 173 to 109 for the Thailand income panel, from 260 to 151 for the Viet Nam consumption panel, and from 248 to 147 for the Viet Nam income panel.

The resulting estimates are shown in Appendix Tables A1 and A2. As expected, the estimates of absolute and relative IOP decrease with the lower number of types, but not by much. For instance, Table A1 reports the change in the relative IOP measures with the reduced number of types as compared with the estimates in Tables 3 to 6. Each column reports 18 estimates of the change in relative IOP corresponding to 6 years each for the GE(0), GE(1) and GE(2) measures. The results show that with the exception of the Viet Nam income panel, the change in relative IOP is 6 percentage points or less for most cases: 2 out of 18 cases for the Thailand consumption panel, 1 out of 18 for the Thailand income panel, and none out of 18 for the Viet Nam consumption panel. Mostly,

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<sup>11</sup> We also experimented with LASSO techniques for reducing the dimensionality of our types, using cross validation methods that minimize the out-of-sample prediction error when the sample is randomly partitioned into a number of folds. We experimented with 5-10 fold partitions. However, the procedure yielded too few types, perhaps reflecting the relatively small size of our samples, leading us to abandon this approach.

the changes are within the 3 to 5 percentage point range. Only for the Viet Nam income panel do we find larger changes ranging between 5 and 13 percentage points. In light of the large reduction in the number of types, which, by construction, must reduce IOP, this evidence on the whole is indicative of relatively modest sensitivity of estimated IOP to the breadth of types identified.

More significantly, our results on the circumstance elasticities are highly robust to the reduction in the number of types (Table A2). Circumstance elasticities not significantly different to unity is still the dominant finding, accounting for 65% to 95% of type-year cases for consumption and 62% to 95% of cases for income.

## **5. Conclusion**

While point estimates of IOP in the income space or in the consumption space (as a proxy for permanent income) are common in the literature, the evidence on changes in IOP has been limited especially for developing countries, reflecting in large part the paucity of suitable data. This paper is an attempt to address this gap by utilizing panel data for two developing countries, Thailand and Viet Nam, to explore the evolution of (ex-ante) IOP over time, using a set of baseline circumstance variables. Over a 10-year period for each country, with six rounds of data from 2007 to 2017, our findings suggest that relatively high shares of IOP in overall consumption inequality are enduring despite rapid growth especially in Viet Nam. This is also true of the share of IOP in income inequality for Thailand, while in the case of Viet Nam a declining share of income IOP is suggestive of the improvement in IOP being mostly limited to the transitory component of income.

A second contribution of the paper lies in proposing and constructing estimates of the circumstance elasticity of income or consumption by year for each household type

(identified by its specific combination of baseline circumstances). The circumstance elasticities offer a potentially useful metric of the responsiveness of income or consumption outcomes to pre-existing circumstances. Our key finding that these elasticities are not different from unity for the large majority of household types and that they are non-declining (or even increasing) over time point to a high degree of persistence in the effects of given circumstances on welfare outcomes.

There can be no presumption that economic growth will reduce IOP. The persistent effects of circumstances, as documented in this paper, point to the need for corrective policy action that can expand the set of opportunities for those who have only a few of them. The analysis and findings of the paper prepare the groundwork for further research into identifying the combination of circumstances and attributes that contribute most to aggregate IOP and, hence, are most worthy of such corrective policy action.

**Table 1: Index Numbers of Real Mean per Capita Income and Consumption**

Year	Thailand		Viet Nam	
	Mean per capita consumption	Mean per capita income	Mean per capita consumption	Mean per capita income
2007	100	100	100	100
2008	101	100	92	116
2010	107	145	113	144
2013	132	160	136	186
2016	169	212	174	268
2017	155	205	201	279

Note: Real mean consumption and income are obtained using the consumer price index for each country.  
Source: Thailand Viet Nam Socio Economic Panel.

**Table 2: Percentage of Households with Different Circumstance Attributes**

Circumstance Attribute	Thailand	Viet Nam
Female headship	26.1	14.0
Year of birth		
1972–1987	4.6	18.9
1957–1971	35.5	45.5
1942–1956	38.8	24.0
Before 1942	21.1	11.6
Ethnic minority	6.7	21.7
Level of education <sup>a</sup>		
1	11.0	28.5
2	66.7	15.6
3	13.2	19.3
4	4.0	17.4
5	5.1	19.3
Serious illness or underweight	31.5	46.2
Province <sup>b</sup>		
1	37.6	33.7
2	45.0	32.4
3	17.4	33.9

<sup>a</sup> Level 1 represents the lowest level of education and level 5 represents the highest, corresponding to less than primary, completed primary but less than lower secondary, completed lower secondary but less than upper secondary, completed upper secondary but less than tertiary, and tertiary and above.

<sup>b</sup> Thailand: Province 1 = Buriram; Province 2 = Ubon Ratchathani; Province 3 = Nakhon Panom; Viet Nam: Province 1 = Ha Tinh; Province 2 = Thua Thien Hue; Province 3 = Dak Lak.

Source: Thailand Viet Nam Socio Economic Panel.

**Table 3: Estimates of Inequality of Opportunity—Thailand, Consumption Panel**

Inequality measure/ Year	I	IOP	IOP/I
<b>GE(0)</b>			
2007	0.184	0.035	0.188
2008	0.228	0.042	0.183
2010	0.206	0.034	0.167
2013	0.211	0.040	0.191
2016	0.213	0.041	0.193
2017	0.212	0.040	0.187
<b>GE(1)</b>			
2007	0.197	0.044	0.224
2008	0.262	0.048	0.184
2010	0.229	0.037	0.161
2013	0.232	0.047	0.201
2016	0.231	0.048	0.210
2017	0.235	0.046	0.194
<b>GE(2)</b>			
2007	0.264	0.068	0.257
2008	0.411	0.063	0.152
2010	0.341	0.042	0.124
2013	0.326	0.066	0.203
2016	0.312	0.068	0.218
2017	0.330	0.060	0.181
Number of households		1,770	
Number of circumstance types		189	
Note: For each year, the table shows estimates of overall inequality (I), inequality of opportunity (IOP), and the share of inequality of opportunity in overall inequality (IOP / I). Three additively decomposable inequality measures within the Generalized Entropy class are shown: GE (0): Mean Log Deviation; GE (1): the Theil measure; and GE (2): half of squared Coefficient of Variation. Source: Authors' estimates.			

**Table 4: Estimates of Inequality of Opportunity—Viet Nam, Consumption Panel**

<b>Inequality Measure/ Year</b>	<b>I</b>	<b>IOP</b>	<b>IOP/I</b>
<b>GE(0)</b>			
2007	0.176	0.069	0.392
2008	0.167	0.054	0.322
2010	0.148	0.051	0.345
2013	0.189	0.056	0.298
2016	0.212	0.081	0.381
2017	0.212	0.073	0.346
<b>GE(1)</b>			
2007	0.184	0.071	0.387
2008	0.182	0.054	0.299
2010	0.155	0.050	0.324
2013	0.199	0.054	0.274
2016	0.215	0.075	0.350
2017	0.220	0.068	0.311
<b>GE(2)</b>			
2007	0.235	0.079	0.335
2008	0.251	0.058	0.233
2010	0.200	0.053	0.265
2013	0.276	0.056	0.202
2016	0.288	0.076	0.265
2017	0.303	0.068	0.225
Number of households		1,708	
Number of circumstance types		260	
Note: For each year, the table shows estimates of overall inequality (I), inequality of opportunity (IOP), and the share of inequality of opportunity in overall inequality (IOP / I). Three additively decomposable inequality measures within the Generalized Entropy class are shown: GE(0): Mean Log Deviation; GE(1): the Theil measure; and GE(2): half of squared Coefficient of Variation. Source: Authors' estimates.			



**Table 5: Estimates of Inequality of Opportunity—Thailand, Income Panel**

<b>Inequality Measure/ Year</b>	<b>I</b>	<b>IOP</b>	<b>IOP/I</b>
<b>GE(0)</b>			
2007	0.436	0.102	0.233
2008	0.475	0.137	0.288
2010	0.365	0.079	0.216
2013	0.492	0.120	0.244
2016	0.321	0.070	0.218
2017	0.336	0.071	0.211
<b>GE(1)</b>			
2007	0.415	0.115	0.278
2008	0.438	0.169	0.386
2010	0.361	0.085	0.235
2013	0.433	0.130	0.300
2016	0.321	0.085	0.264
2017	0.339	0.091	0.269
<b>GE(2)</b>			
2007	0.582	0.162	0.279
2008	0.613	0.274	0.447
2010	0.497	0.105	0.210
2013	0.609	0.186	0.305
2016	0.440	0.125	0.285
2017	0.468	0.153	0.326
Number of households		1,405	
Number of circumstance types		173	
Note: For each year, the table shows estimates of overall inequality (I), inequality of opportunity (IOP), and the share of inequality of opportunity in overall inequality (IOP / I). Three additively decomposable inequality measures within the Generalized Entropy class are shown: GE(0): Mean Log Deviation; GE(1): the Theil measure; and GE(2): half of squared Coefficient of Variation. Source: Authors' estimates.			

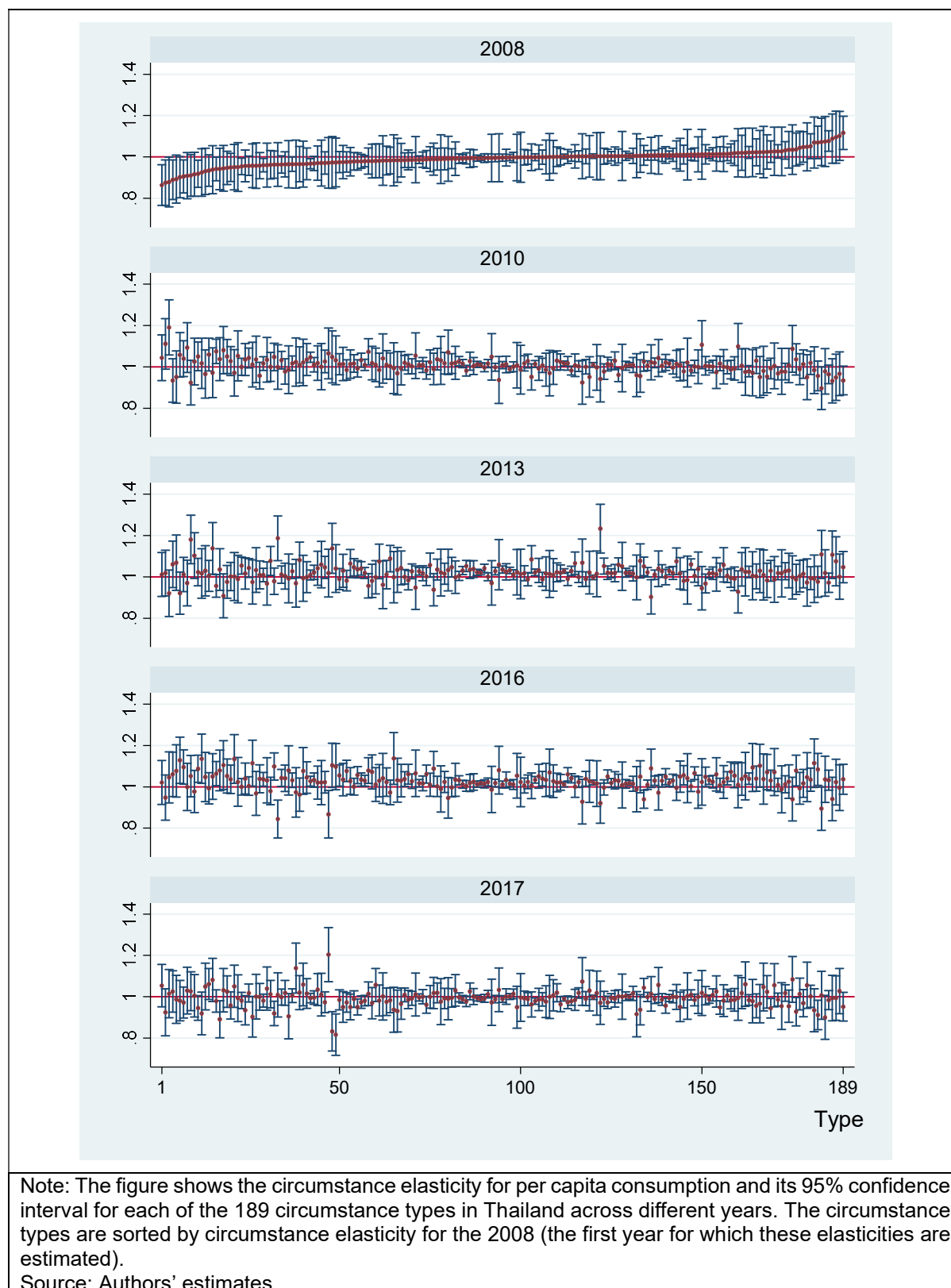
**Table 6: Estimates of Inequality of Opportunity—Viet Nam, Income Panel**

<b>Inequality measure/ Year</b>	<b>I</b>	<b>IOP</b>	<b>IOP/I</b>
<b>GE(0)</b>			
2007	0.536	0.236	0.440
2008	0.428	0.177	0.414
2010	0.353	0.122	0.345
2013	0.438	0.145	0.330
2016	0.337	0.122	0.364
2017	0.312	0.094	0.302
<b>GE(1)</b>			
2007	0.446	0.235	0.526
2008	0.373	0.183	0.491
2010	0.322	0.124	0.385
2013	0.389	0.132	0.340
2016	0.317	0.116	0.368
2017	0.297	0.089	0.299
<b>GE(2)</b>			
2007	0.572	0.296	0.517
2008	0.454	0.233	0.513
2010	0.392	0.150	0.383
2013	0.495	0.146	0.295
2016	0.398	0.125	0.314
2017	0.375	0.094	0.251
Number of households		1,381	
Number of circumstance types		248	
Note: For each year, the table shows estimates of overall inequality (I), inequality of opportunity (IOP), and the share of inequality of opportunity in overall inequality (IOP / I). Three additively decomposable inequality measures within the Generalized Entropy class are shown: GE(0): Mean Log Deviation; GE(1): the Theil measure; and GE(2): half of squared Coefficient of Variation. Source: Authors' estimates.			

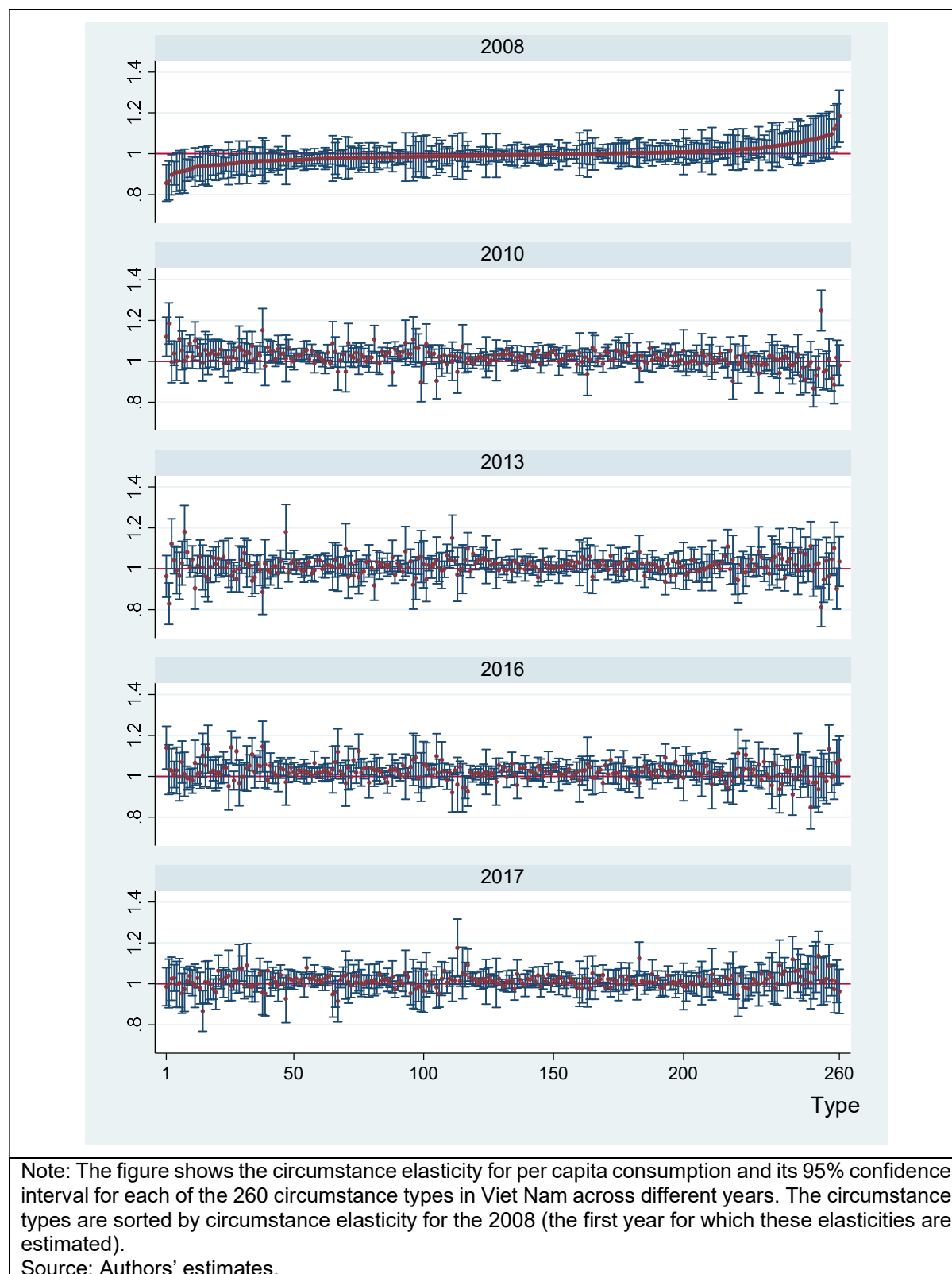
**Table 7: Percentage of Circumstance Elasticities Not Significantly Different to Unity**

Year	Consumption		Income	
	Thailand	Viet Nam	Thailand	Viet Nam
2008	93.7	91.5	91.9	79.4
2010	95.8	73.5	75.1	81.0
2013	82.5	85.0	90.2	83.9
2016	73.5	81.2	61.8	71.8
2017	92.1	92.7	92.5	89.1
Number of circumstance types	189	260	173	248
Note: For each circumstance-type and for each year, we test if their circumstance elasticity equals 1. The table reports the percentage of circumstance types for whom the circumstance elasticity is not significantly different from 1. Source: Authors' estimates.				

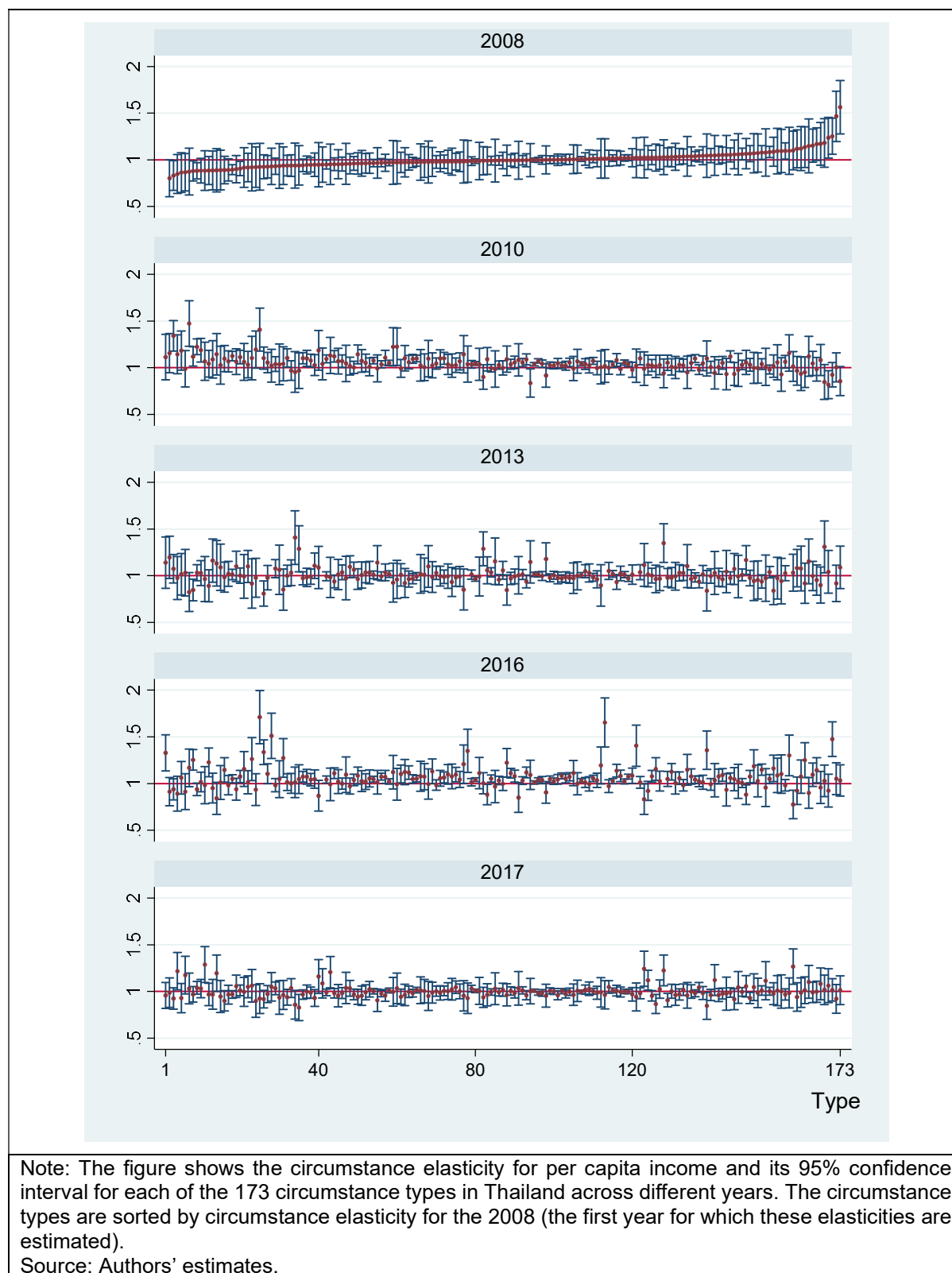
**Figure 1: Circumstance Elasticities for Consumption for Each Household Type in Thailand, by Year**



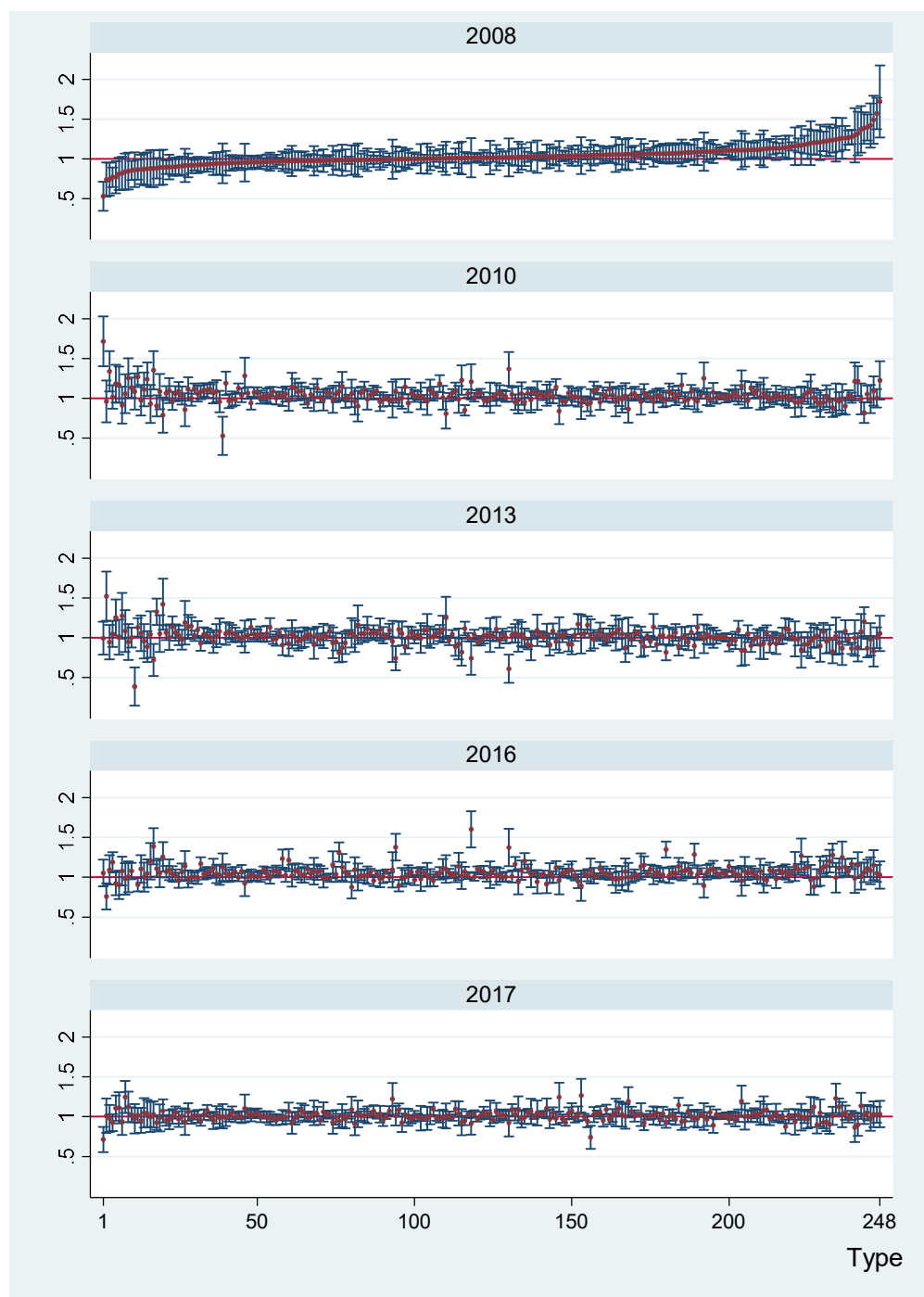
**Figure 2: Circumstance Elasticities for Consumption for Each Household Type in Viet Nam, by Year**



**Figure 3: Circumstance Elasticities for Income for Each Household Type in Thailand, by Year**



**Figure 4: Circumstance Elasticities for Income for Each Household Type in Viet Nam, by Year**



Note: The figure shows the circumstance elasticity for per capita income and its 95% confidence interval for each of the 248 circumstance types in Viet Nam across different years. The circumstance types are sorted by circumstance elasticity for the 2008 (the first year for which these elasticities are estimated).

Source: Authors' estimates.

## Appendix

Table A1: Change in Relative Inequality of Opportunity with a Smaller Number of Household Types				
Year	Consumption		Income	
	Thailand	Viet Nam	Thailand	Viet Nam
<b>GE(0)</b>				
2007	-0.05	-0.06	-0.04	-0.09
2008	-0.04	-0.05	-0.04	-0.09
2010	-0.03	-0.06	-0.05	-0.10
2013	-0.05	-0.06	-0.06	-0.08
2016	-0.04	-0.05	-0.04	-0.07
2017	-0.03	-0.05	-0.04	-0.05
<b>GE(1)</b>				
2007	-0.06	-0.05	-0.04	-0.10
2008	-0.04	-0.05	-0.04	-0.11
2010	-0.03	-0.06	-0.04	-0.11
2013	-0.05	-0.06	-0.07	-0.09
2016	-0.04	-0.05	-0.05	-0.08
2017	-0.03	-0.04	-0.05	-0.05
<b>GE(2)</b>				
2007	-0.09	-0.05	-0.02	-0.10
2008	-0.04	-0.04	-0.04	-0.13
2010	-0.02	-0.06	-0.04	-0.12
2013	-0.08	-0.04	-0.06	-0.09
2016	-0.03	-0.04	-0.05	-0.08
2017	-0.03	-0.03	-0.05	-0.05
Number of circumstance types	116	151	109	147
Reduction in the number of types	39%	42%	37%	41%
IOP = inequality of opportunity. Note: The table shows the change in relative IOP with a smaller number of circumstance type as compared with the relative IOP estimates with a larger number of types as reported in Tables 3 to 6. Source: Authors' estimates.				



**Table A2: Percentage of Circumstance Elasticities Not Significantly Different to Unity with a Smaller Number of Household Types**

Year	Consumption		Income	
	Thailand	Viet Nam	Thailand	Viet Nam
2008	92.2	88.7	91.7	76.9
2010	94.8	64.9	71.6	75.5
2013	79.3	84.1	89.9	79.6
2016	69.0	70.9	62.4	61.9
2017	89.7	88.7	94.5	89.8
Number of circumstance types	116	151	109	147

Note: For each circumstance-type and for each year, we test if their circumstance elasticity equals 1. The table reports the percentage of circumstance types for whom the circumstance elasticity is not significantly different from 1.

Source: Authors' estimates.

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## **Measuring Persistent Effects of Circumstances and Inequality of Opportunity Using Panel Data**

This paper examines the evidence on inequality of opportunities or the component of inequality attributable to circumstances beyond a person's control to help understand how socioeconomic inequalities persist over time. Current approaches to measuring inequality of opportunities mainly depend on analyses of cross-sectional survey data. Using panel data from Thailand and Viet Nam, this paper pioneers a dynamic approach to measuring inequality of opportunities and contributes to the understanding of inequality of opportunity's temporal variations.

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