Growth and Convergence in Southeast Asia Sugarcane Industries

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Abstract

This paper analyses growth and convergence on sugarcane industry in southeast Asia countries. Important questions in this paper are whether the growth of sugar cane industry in Southeast Asia moves toward a convergence or divergence trend over time and to what extent the economic integration influences the development and policy of those countries. This paper is a cross-country study and employs GLS techniques. Some countries involved in the analysis are Indonesia, Malaysia, Thailand, Cambodia, Laos, Myanmar, The Philippines, and Vietnam. The finding suggests that based on β convergence approach, both basic variable and equation with dummy indicate that these variables could explain the convergence and speed of convergence within the industry. Furthermore, The regression results also strengthen the finding of σ - convergence.

Keyword: Convergence, Growth, Sugarcane.

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1. Introduction

Sugar is one of the most policy distorted of all commodities, with a history of protection dating back to at least the 1800s. Such high protection has led to a number of problems, as producers and consumers respond to high prices, and firms adjust their operations to benefit from high prices or to evade high prices if they manufacture products which use sugar. One of the unwanted consequences of high protection is surplus sugar production which is then disposed of in the world market at subsidized prices. Many countries have been pressured to protect domestic producers from heavily subsidized exports and depressed world market prices. This cycle of protection, subsidies, and more protection has been occurring for decades. Efforts to reform sugar policies and stop the cycle of protection leading to more protection may finally pay off because the European Union and the United States—two of the worst offenders—now have internal pressures to reform sugar policies, which may prove more effective than external pressures (Mithcell, 2004) .

Protected markets, special trade arrangements and prices that are remarkably volatile characterize the sugar trade. At the same time the market for freely traded sugar is large and deep compared with other agricultural commodities. Sophisticated and liquid financial markets (forward, futures and derivatives) supplement the physical trade. Understanding this unusual blend of free and protected markets is important for policymakers during the process of domestic market reform for several reasons. First, producer groups often base successfully arguments for government protection on the policies of other countries. Second, many market interventions are long-lived, and the accumulated results these interventions generate can complicate the reform process (Larson and Borell, 2004).

Accumulated investments in land, capital and human resources are often premised on domestic policy interventions or special access to protected markets in the EU or United States. In a few countries, such as Fiji and Mauritius, export earnings from sales to protected markets are important to the economy as a whole, contributing significantly to national incomes, currency reserves and government

revenues. For these countries, policy changes in destination markets can have macroeconomic consequences. Understanding the variability in the sugar market and the secondary and derivative markets for sugar is useful as well. Government interventions to stabilize sugar prices can crowd out international markets as risk management instruments and inhibit the development of domestic risk management practices. Conversely, the international markets for risk management offer opportunity to mitigate the consequences of volatility introduced by domestic reforms (Larson and Borell, 2004).

In other hand, sugar production has two cost components: field and processing. For most agricultural crops, production, storage, and processing are independent activities, and markets exist for both processed and unprocessed commodities. But field and factory costs in the sugar industry (from sugar cane to raw sugar) are interdependent. In most countries, sugar producers and processors are separate economic entities that can achieve economic efficiency only through cooperative behavior.

Sugar cane, the main input factor in sugar industry among countries (Eaostat, 2004), is bulky and degrades soon after harvesting. The high cost of transporting it creates local monopolies and monopsonies. Conflicts between producers and processors are common and are often exacerbated by the need to share costs. For example, minimizing field costs often requires a planting and harvesting cycle that produces cane for processing during a relatively short period. But the increased sugar processing capacities needed during this period raise mill owners' fixed costs. Spreading deliveries over an extended period minimizes processing costs. As a result scheduling and pricing conflicts often emerge between producers and processors. Frequently, the conflicts spill over into political confrontations.

The policies of countries that dominate the sugar cane's production those of less important players in two significant ways. First, the pervasive interventions of the larger countries encourage others to institute protectionist policies. The influence can be indirect (through unilateral trade policy) or more explicit, especially during the negotiation of regional trade agreements such as the

agreement of the Association of Southeast Asian nations (ASEAN) and the others. Second, special access agreements often result in domestic sugar industries that are dependent on externally determined policies and give rise to domestic policies designed to allocate rents from the access agreements. Examples include domestic sugar policies in Fiji, Cuba, the Philippines, and Zimbabwe.

The appearance to analyze disparity and growth on sugar cane production the so-called 'new growth theory' and 'new economic geography' has spurred an extensive empirical literature. One main topic in this literature is the convergence hypothesis. New and old growth theories differ in their predictions on whether economic development will result in convergence or divergence in output between countries and regions. Economic geography indicates that economic integration can result in both divergence and convergence.

Quah (1996a) have argued that the usual measures of convergence may be misleading. Maurseth (2001) argue that cross-section studies may be plagued by Galton's fallacy of regression towards the mean. Quah (1996a) argue that most studies treat the geographical entities in question as 'isolated islands' without taking into account interaction between them. An important ingredient in both new growth theories and economic geography is that interregional interaction may have significant influence on relative economic performance.

A striking fact about world economic development is that economic activity seems to cluster on limited geographical space. In the case of sugar cane industry, a set of Southeast Asia, in example, Indonesia, Malaysia, Thailand and Vietnam, These regions are characterized by high levels of Sugar Cane production. Other regions, generally peripheral ones, experience lower of output.

Important questions in this paper are whether the growth of sugar cane in Southeast Asia a convergence or divergence over time? and to what extent economic integration influences the development and policy of countries? To answer the question, in this paper done by generalized least square regression techniques analysis and used the distribution of the logarithmic sugar cane's output data which normalized to other regions sharing specific characteristics.

The paper is therefore structure as follows. The next section reviews some conclusions from theories on economic growth and regional economic development. Emphasis is put on interdependence, when it using in this paper. In Section 3 describe theoretical measures of convergence, methodological and data will being used. In Section 4 discussed empirical measures of convergence a discussed along with a new measure that takes into account interaction between regions. Section 5 concludes and proposed direction for further research.

2. Theoretical Framework

In the neo-classical growth model (Solow, 1956;Barro and Sala-I-Martin, 1995), the engine of growth in the *short run* is capital accumulation. Since decreasing returns to capital are assumed, regions with smaller output are predicted to grow faster than bigger ones, either unconditionally or conditioned on others factors of importance that the traditional model does not incorporate (Mankiw et al., 1992). Technological change is assumed to be exogenous and technology is treated as a public good. Therefore, long run growth also becomes exogenous.

If one opens up the model for trade, the trading regions experience a once and for all income gain due to increased static efficiency. Ventura (Maurseth, 2001) demonstrates that trade also has dynamic effects. In case of factor price equalization, decreasing returns to capital only apply for the world on average and not for individual regions. A weak form of convergence is still present as more and more countries become more capital intensive. In the case of financial integration, convergence is expected to be fast since poor and capital deficient regions experience inflows of capital due to high returns to this factor of production (Persson, 1997).

2. 1. Endogenous growth theories

A major shortcoming in the neo-classical growth model is that technological progress is assumed to be exogenous. Endogenous growth theories attempt at incorporating some of the peculiar characteristics of technology and knowledge. Knowledge is a non-rival and only partially excludable good. It is also cumulative, in the sense that new knowledge builds on previously obtained insights. The deficient excludability and the cumulative aspects of knowledge production imply that there are spillovers from production of knowledge (Arrow, 1962). Such spillovers may generate increasing returns that are consistent with competitive markets (Romer,1986; Barro and Sala-I-Martin, 1995). In several recent growth models, knowledge production is introduced as a distinct economic sector (Romer, 1990). These models do not predict convergence. Growth will be an increasing function of the workforce employed in R&D and of aggregated knowledge. Romer's model predicts dynamic effects of economic integration: firstly, by trade an economy gets access to larger markets and larger flows of new product varieties. Secondly, economic integration allows national researchers to draw on a larger knowledge base in their research.

2. 2. Bounded Spillovers

When spillovers are global in scope and flow freely between regions and countries there will be convergence. In this case, the difference between the neo-classical model and the endogenous growth theory is that growth is explained rather than assumed. If technology spillovers are bounded, the results change. Krugman (1985) and Lucas (1988) develop the framework of *dynamic comparative advantages*. If some industries have a potential for higher productivity growth than others, regions specialized in these industries experience higher growth rates than other regions do, i.e. a diverging economic development. Related to this tradition are theories of technology gaps. Important is the ability of countries lagging behind a technological forefront to adapt to and imitate new technologies. Diffusion leads to convergence while innovation at the forefront

increases the length of the ladder to climb for followers The ability of regions with smaller output to make use of technology developed elsewhere is assumed to depend on their own absorptive capacity (Helme et al, 2004).

2. 3. Economic Geography and Growth

The recent theories of economic geography explore the interplay between increasing returns at the plant level, market size and geographical distance (Krugman,1991). With increasing returns and transportation costs, firms will tend to establish themselves in large markets. Models of economic geography therefore often predict lower production and income in peripheries. A common result in new economic geography is an inverted U-shaped relationship between concentration of industrial production and transportation costs. For very high transportation costs there must be local production. For intermediate transportation costs, production is localized in the largest markets. For very low transportation costs, market access becomes irrelevant (Fujita et al, 1999).

If technology spillovers decline with distance, neighbors to rich and innovative regions should benefit more from technological spillovers than distant regions. Martin and Ottaviano (1996) and Baldwin et al. (1998) are recent contributions that incorporate insights from new economic geography and endogenous growth. They provide models that have in common both wi endogenous growth theory and 'new economic geography' that divergence or convergence is a question of interaction between economic regions rather than internal conditions in each individual region alone (Amstrong, 2001).

From the above review, the neo-classical hypothesis about convergence should be supplemented with hypotheses from other strands in the literature. Firstly, innovation and spillovers should be expected to influence positively on growth. Secondly, geography should be introduced into analyses of growth even if theory does not support any unambiguous hypothesis of the impact of geography on economic growth. In next section describe theoretical measures of convergence, methodological and data will being used.

3. Methodology and Data

3.1 Measuring Convergence

For empirical research, several measures of convergence have been proposed. In this paper most attention is paid to the two most commonly used concepts of σ and β convergence (Barro and Sala-I-Martin, 1995). In addition, another concept of convergence will be introduced, denoted *conditional* σ *convergence*. β Convergence denotes that poor regions on average grow faster than richer regions.

$$g = \alpha - \beta \log(y_{it-T}) + u_{it} \qquad (1)$$

In case of sugar cane industry, convergence is present if one obtains a negative coefficient for initial level of sugar cane production in a cross-section regression on growth rates for a sample of geographical entities according to the regression equation.

$$g = \alpha - \beta \log(y_{it-T}) + X_{it} + D_{it} + u_{it} \qquad (2)$$

In Equation (1) g denotes the average annual growth rate and y_{it} denotes sugar cane output in region *i* at time *t*. *T* denotes the time from the initial year to the last year. *u* is the regression residual. In Equation (2) *D* denotes dummy variable in time *t* or at region *i*. One distinguishes between conditional and unconditional β convergence according to whether other relevant variables in example dummy variable denoted by D or determinant of growth, denoted by the vector ***X***, are included in Equation (2) and or not.

$$g = \frac{1}{T}\left(\frac{y_{it}}{y_{it-T}}\right) \qquad (3)$$

The rate of convergence, *b*, which denotes the speed at which a country or region approaches its steady state income level, is related to β as in Equation (4):

$$\beta = -\left(\frac{1-e^{-bT}}{T}\right) \qquad (4)$$

A more restrictive version of convergence is σ convergence. σ convergence denotes that the standard deviation of sugar cane's output in a sample of entities decreases over time. σ convergence is a stronger criterion than β convergence in the sense that absence of σ divergence can co-exist with β convergence.

$$\sigma_{yt}^2 = (1-\beta)^2 \sigma_{yt-1}^2 + \sigma_u^2 \qquad (5)$$

The relation between β and σ convergence may be derived from Equation (1) or equation (2). Rewriting Equation (1) or (2) and setting T=1, a difference equation of log(y_{it}) is obtained. Given that y and u are uncorrelated, the sample variance of this gives Equation. (5) in which σ_{yt}^2 denotes sample variance of the log of sugarcane's output in year t and σ_u^2 is the sample variance of u.

3.2 . Method

In light of these considerations, our approach to convergence estimation in this study is to estimate panel data uses generalized least square (GLS) with regional dummy. Panel data give more informative data, more variability, less collinearity among the variable , more degrees of freedom and more efficiency. Beside that panel data allow us to construct and test more complicated behavioral model than purely cross-section or time –series data (Baltagi,2002). We use the GLS approach because The GLS technique pays less attention to residual associated with high-variance observation (by assigning them a low weight in the weighted sum of square residuals it minimize). Notice that the OLS estimating line gives a better fit to the data then the true relationship (Kennedy,1996) .

3.3. Data

In this paper, we have used the data published at the country level by FAOSTAT in the data set of sugarcane output in metrics tons. The countries data for this information is annual data and which available since 1961. Countries data which produce sugar cane in Southeast Asia are: Indonesia, Malaysia, Thailand, Cambodia, Laos, Myanmar, The Philippines, and Vietnam. This countries are cross section identifiers in panel data which time series data set in analysis is 1961-2000.

4. Empirical Result

4.1. β- Convergence

β- convergence is the coefficient level of sugarcane output at the beginning of the period if the annual growth rate of the sugarcane output being regress toward the level of sugarcane output at the beginning of the period. If the coefficient is minus and statistically significant its means that β - convergence has occur and the implication is the growth of sugarcane output in the countries which have smaller output of sugarcane will grow faster than the countries which have bigger output of sugarcane so that they tends to catch the bigger output countries.

Table 1. shows the result of regression equation (1) with GLS method for the whole sample in each five year period. The table contain coefficient level of sugarcane output (β), *standard errors* (inside brackets), estimation of speed convergence (b) and *R-square* for the basic equation and the equation with regional dummy. All equation has been estimate with include the slope but not reported. The β- coefficient of the sample period 1966-2000 have minus value and statistically significant both on the basic equation and equation with regional dummy. It's indicates the proof of β- convergence has been occur in sugarcane industry among the Southeast Asia countries .

From the each five year observation , β - convergence in Southeast countries occurs in period 1976 – 1980 ; 1981 – 1985 ; 1986 – 1990, both on basic

equation and equation with dummy variable. According to Kotler and Kertajaya (2000), countries toward the front tend to transfer "older" industries to countries at the back. This process is continuous because changes in comparative superiority. It's explain why in the sugarcane industry, the countries with smaller sugarcane output tends to grow faster than the bigger countries. That's phenomenon clarify the role of speed convergence can show from table 1.

Table 1. β- Convergence

periods	Basic Equation				Equation With Regional Dummy			
	B-conv	t-stat	speed of conv	R-square	β-conv	t-stat	speed of conv	R-square
1966-2000	-0.012405 (0.002227)	-5.5701	0.01627058	0.0498	-0.022095 (0.003618)	-6.1064	0.0424068	0.0854
1966-1970	-0.011406 (0.0018759)	-6.0827	0.01174416	0.5464	-0.0000236 (0.004662)	-0.0051	0,000023601	0.6539
1971-1975	0.006768 (0.004372)	1.5481	-0.00665601	0.4672	-0.001523 (0.007818)	-0.1948	0.00152883	0.4221
1976-1980	-0.019305 (0.003485)	-5.5397	0.02030137	0.5149	-0.040337 (0.003272)	-12.3276	0.0450504	0.9228
1981-1985	-0.011775 (0.003924)	-3.0006	0.01213586	0.2742	-0.025887 (0.006941)	-3.7294	0.02772257	0.4072
1986-1990	-0.025907 (0.005127)	-5.0530	0.02774555	0.3941	-0.042259 (0.007946)	-5.3181	0.04747258	0.5347
1991-1995	0.013683 (0.002841)	4.8170	-0.01323525	0.3623	0.002423 (0.007235)	0.3350	-0.00240844	0.4179
1996-2000	-0.008998 (0.004618)	-1.9484	0.00920669	-0.0359	-0.017845 (0.011582)	-1.5408	0.01869188	-0.0290

Table 1. column (4) and (8) report the speed of convergence per each period. The speed of convergence (b) for the whole sample (1966-2000) is 4 percent per year. It's implicate that in every year, each observer countries have decrease the gap of sugarcane output 4 percent per year. The deferent of speed convergence result, show from the estimation from basic equation. Because its not being clarify with the deferent of both smaller and bigger producer countries.

The interesting phenomenon occurs at the period 1966 – 1970 and 1996 - 2000, β- coefficient statistically significant on basic equation but statistically not significant on equation with regional dummy. Dummy variable can clarify the influence of biggest sugarcane producer countries in Southeast Asia i.e. Indonesia,

Thailand, Vietnam and the Philippines, but the estimating result being *bias* and statistically not significant. At 1966-1977 period, it is indicates of non economical phenomenon in biggest sugarcane producer countries could disturb the statistically analysis of whole observer countries. i.e. Vietnam war, communist coup in Indonesia etc. Its also explain the impact of the Asian crises at 1996-2000 period.

At the period 1971 – 1975 , β-coefficient on basic equation has plus value, it's indicates divergence. Unfortunately , the tends of the divergence statistically not significant. But at the period 1991 – 1995 coefficient level of sugarcane output at the beginning of the period on both basic equation and equation with regional dummy has positive value and statistically significant , it's indicate the occur of divergence. It happen because several measures of several bigger countries i.e. promoted sugarcane planting and processing, including credit subsidies, protection of local industry from cheaper imports, and local policies favoring the conversion of land to sugarcane production. It is an open question whether or not these policies have been beneficial to the country (World Bank, 2001). On those period of observation, the speed of convergence (b) shows that the gap of smaller and bigger producer output was increase.

4.2. σ Convergence

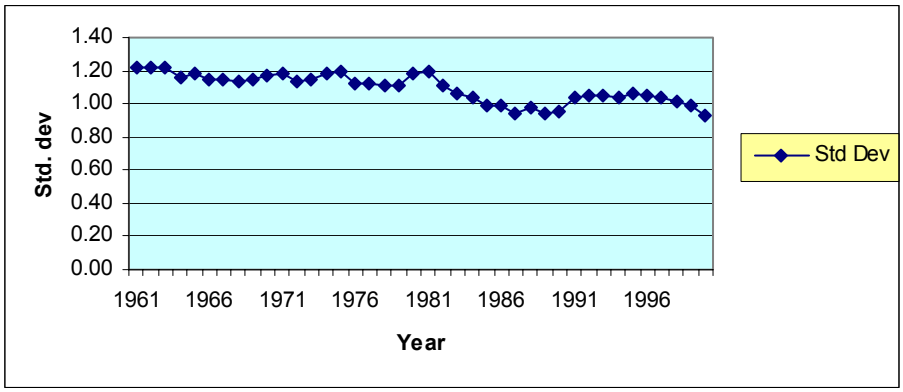
σ - convergence measured by standard deviation of sugarcane output production per year. If the standard deviation is decline in each year, its mean that the σ- convergence has been occur and the implication is gap between output of sugarcane in each countries being smaller. The phenomenon can be occurs because of economic or non economics phenomena in each countries or spatial correlation of relevantly occurrence among countries (Ansellin, 1988). Table 2. shows that the standard deviation of sugarcane output per year has decline from 1,22302 in 1961 to 0.933291 in 2000 which clarify and emphasize that convergence hypothesis happen on sugarcane industry in southeast Asia at periods.

Table 2. σ- Convergence

Year	Std. Dev.	year	Std. Dev.	year	Std. Dev.	year	Std. Dev.
1961	1.22302	1971	1.17715	1981	1.189824	1991	1.038026
1962	1.220647	1972	1.13354	1982	1.109457	1992	1.049475
1963	1.214554	1973	1.142896	1983	1.061942	1993	1.046738
1964	1.161191	1974	1.179499	1984	1.034365	1994	1.041581
1965	1.177497	1975	1.196331	1985	0.987905	1995	1.067455
1966	1.145183	1976	1.122627	1986	0.987804	1996	1.054049
1967	1.144661	1977	1.125548	1987	0.936338	1997	1.038767
1968	1.133849	1978	1.111887	1988	0.974771	1998	1.008052
1969	1.149868	1979	1.11278	1989	0.944599	1999	0.988741
1970	1.1668	1980	1.1788	1990	0.94783	2000	0.933291

Chart 1. Measure of convergence process which show the fluctuation of logarithmic standard deviation on the sugarcane output across countries in observation year. It phenomenon can explained with prior argument as similarity before. The empirical studies before may be explain that it occurs because the influences of external factor or influences of sugar policy in each countries.

Chart 1. σ- Convergence



The results of β - convergence both basic variable and equation with dummy variable into the regression equation with GLS method indicate that these variables do have effects in addition to convergence. Each analysis can explain both why convergence happened and speed of convergence meaning. In addition

The most dummy variables have very significant coefficients of the right sign and can emphasize it. Regional dummy with explanatory power of the regression and the significance of the convergence should be noted that regional influenced from bigger sugarcane producer countries. The results also strengthen the hypothesis that when σ - convergence are accounted.

4.3. Policy Implication

Sugarcane producers in southeast Asia can't avoid from the effect of convergence on sugarcane industry. To anticipate this effect, they must formulate strategies and policies to upgrading the performance of sugar industries in each countries. In several countries, sugar policy has been used as a strategy of rural industrialization and development of regions with lower agricultural potential where have witnessed new investments in production and processing of sugarcane. The debate on economic policy is animated in view of the political economy dimension. While it is clear that the high cost of sugar policy are paid by a multitude of unorganized consumers, the benefits are obtained by a minority of farmers and sugar industry participants who are quite active in promoting their interests on the economic aspect of sugar.

The economic aspects of sugar policy are often mixed with emotional aspects suggesting that sugar sector development is a show case for rural industrialization. The system of production (large factory surrounded by large sugar plantations) lends itself to be interpreted as a good example of rural industrialization in spite of the high cost that such policy might have. These considerations suggest the need to look further into two types of distortions of the sector: a) import restrictions; and b) subsidies to production and processing (Goletti and Rich, 1998 b).

The analysis of the effects of liberalization of trade conducted in Goletti and Rich (1998 a) shows that the current trade policy imposes a cost to the country. Trade liberalization would make sugar available at a cheaper prices (22 percent), reduce production of sugarcane by 11 percent and rise consumption by

almost 26 percent. The real income of the country increases by $92 million, as the result of a lower CPI. Contrary to the view of its opponents, liberalization would not destroy domestic production of sugarcane. It would, however, imply a reallocation of the current structure of production with technical performance variation in favor of those regions that have a comparative advantage.

The considerable variation in technical performance of sugar enterprises in Southeast Asia and the industry's comparative international performance against various international benchmarks suggests there is substantial scope for productivity increases . Moreover, the greater the concentration of milling in medium and large mills, the greater the likelihood of such gains being achieved. As previously discussed, larger enterprises are likely to be able to command the resources required to conduct successful research, development and extension programs. And the greater the competition between mills and the fewer discriminatory subsidies paid, the greater the incentive for these mills to pursue productivity gains (Goletti and Rich, 1998 b).

At what rate productivity gains will be achieved is a difficult question to answer. Much will depend on the policy environment in which they take place and on the various cultural, political and economic phenomenon that stand in the way. Historical data which describe before has been achieved in other countries may provide a starting point about what might be achieved. World Bank (2001) arg that the productivity gains would increase medium and large mills competitiveness relative to small mills.

5.Conclusion

The results of β - convergence both basic variable and equation with dummy the regression equation indicate that these variables do have effects in addition to convergence and speed of convergence. The most dummy variables have very significant coefficients of the right sign. Regional dummy with explanatory power of the regression and the significance of the convergence should be noted that regional influenced from bigger sugarcane producer

countries. The results also strengthen the hypothesis that when σ - convergence are accounted.

In empirical result, we know that sugarcane producers in southeast Asia can't avoid from the impact of convergence on sugarcane industry. They must formulate strategies and policies to upgrade the performance of sugar industry in each countries to anticipate this. With effective and efficient policies, convergence would be making a sustaining growth and reduce of inequality on sugarcane industry in Southeast Asia.

To make the objective and target policy on sugarcane industry, each country can use a strategy of rural industrialization and development of regions with lower agricultural potential where have witnessed new investments in production and processing of sugarcane. rural industrialization show case for the economic aspects of sugar policy are often mixed with emotional aspects.

In addition, we show the effect of trade liberalization in sugarcane industry The considerable variation in technical performance of sugar enterprises in Southeast Asia and the industry's comparative international performance against various international benchmarks suggests there is substantial scope for productivity increases. It would imply a reallocation of the current structure of production with technical performance variation in favor of those regions that have a comparative advantage which suggests on substantial scope for productivity increases. If it happen, the rate of productivity gains will be increase.

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