# What Explains the Evolution of the North South Divide in Italy?

## A Granger Test of the Balassa-Samuelson Hypothesis

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**Abstract:**

This paper investigates the increasing gap in standards of living between the North and the South of Italy during the last two decades and focuses on the relationship between wages, labor market structure, and regional cost-of-living disparities. We interpret the growing purchasing power divide through the dual lens of the Balassa–Samuelson Effect and Graziani's Real Exchange Rate Misalignment Theory, emphasizing the interaction between productivity differentials and nominal wage rigidities in the context of a single national currency. Using aggregate cross-sections of household budget surveys from 1999 to 2019, we compute quality-adjusted cost-of-living indices to control for regional differences in the prices and quality of non-tradable goods and services. We find a growing gap in real living standards, sharply accelerating after the 2008 financial crisis, with particularly adverse effects on younger cohorts. Granger causality tests confirm that productivity differences in the tradable sector are a principal driver of regional cost-of-living divergence, validating the Balassa–Samuelson mechanism. Furthermore, persistent real exchange rate mismatches—rooted in wage rigidity—support Graziani's view that Italy's internal labor market structure hampers regional convergence.

**Keywords:** Cost of Living, Granger Causality, Territorial Differentials, Generational Equity, Quality of Services

**JEL codes :** D12, I31, J3.

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## 1. Introduction

This study examines the evolution of the North-South divide in standards of living in Italy over the past two decades, with a particular focus on differences in regional purchasing power through the lens of the Balassa-Samuelson hypothesis (Balassa, 1964; Samuelson, 1964). The term *divide* is often used to describe geopolitical and economic disparities between regions, such as between Northern and Southern Italy, or more broadly between Northern Europe and the Mediterranean South, where living standards tend to be lower. In Italy, the Southern regions rely more heavily on primary resources and non-tradable goods and services, such as tourism, whereas the North is more specialized in the production of tradable, manufactured goods. Northern Italy benefits from a higher concentration of industrial clusters—particularly in sectors such as machinery, automotive, aerospace, textiles, jewelry, and shipbuilding—as well as from the presence of financial institutions like banks and insurance companies. These agglomeration economies contribute to the North's greater industrial competitiveness compared to the South.

The Balassa-Samuelson hypothesis (BSH) attributes disparities in purchasing power to differences in productivity between the tradable and non-tradable sectors. In the context of Italy, the more developed North produces higher-quality tradable goods and services with greater productivity, while the less developed South is more reliant on non-tradable sectors such as tourism and agriculture. Although Italy shares a common nominal exchange rate across its regions due to its monetary union, differences in regional price levels give rise to variations in the *real exchange rate* (RER). The RER reflects the relative purchasing power of a currency across regions or countries, adjusted for price level differences. In this sense, the North and South of Italy experience distinct real exchange rates: goods and services tend to be more expensive in the North, where wages and productivity are higher, while they are relatively cheaper in the South. This dynamic aligns with the Balassa-Samuelson mechanism, which predicts that regions with higher productivity in the tradable sector will exhibit higher price levels in the non-tradable sector as wages rise across the economy.

Price differentials between Northern and Southern Italy remain substantial and persistent. While the Balassa-Samuelson hypothesis emphasizes differences in total factor productivity—particularly in the tradable sector—as a key driver of regional disparities in purchasing power,

other structural and institutional factors may also play a significant role. These include the size and efficiency of public administration, the political orientation of regional governments, the degree of income inequality (as measured by the Gini index), and macroeconomic trade-offs between equity and efficiency, reflected in regional unemployment and inflation rates. Additionally, disparities in gross fixed capital formation and the prevalence of crime—used here as a proxy for the quality of the local business environment—may further contribute to regional price level differences.

We focus on the interaction between wages, labor productivity, and prices, asking:

- To what extent do productivity differentials in tradables explain regional differences in non-tradable prices?
- How do these gaps evolve in a monetary union with centralized wage-setting?
- What role do institutional rigidities play in sustaining real exchange rate misalignments across regions?

To answer these questions, we adopt a dual-theoretical framework combining the Balassa–Samuelson (BS) effect and Graziani's theory of real exchange rate misalignment. While BS links productivity in tradables to non-tradable price inflation, Graziani emphasizes the importance of wage rigidities in causing persistent mispricing across regions when nominal adjustment mechanisms are absent.

This paper makes four main contributions. First, it estimates the evolution of regional true cost-of-living indices in Italy over the period 1999–2023, accounting for differences in the quality of services. This is done using the methodology developed by Menon et al. (2023), applied to a pooled time series of cross-sectional household budget surveys. Second, it documents that the North–South divide has widened significantly since the 2008 global financial crisis, particularly among younger cohorts. The growing inequality of opportunity across generations raises important concerns about both territorial and intergenerational fairness. Third, the paper provides empirical evidence that changes in total factor productivity Granger-cause the observed gap in regional cost of living, lending support to the Balassa–Samuelson hypothesis. Fourth, the paper makes an original contribution by analyzing wage differentials and wage dynamics in relation to regional productivity and cost structures. We show that nominal wages in the South often exceed what local productivity can sustain, resulting in real exchange rate overvaluation, labor market fragility, and competitiveness loss. Conversely, wages in the North are aligned with or even below productivity levels, reinforcing regional advantages. This finding is consistent with Graziani's theory of real exchange rate

misalignment, and it underscores the central role of national wage-setting institutions in amplifying structural imbalances. By embedding wage dynamics into a framework that includes productivity, prices, and service quality, the paper demonstrates that wage rigidity is a key mechanism through which economic divergence is maintained over time. The robustness of these findings contributes meaningfully to the ongoing discourse on the "two Italies" (Accetturo and De Blasio, 2019; Accetturo et al., 2022; Boeri et al., 2021; Bucci et al., 2021; De Philippis et al., 2022; Cannari and Franco, 2010; Menon et al., 2023; SVIMEZ, 2024).

The remainder of the paper is structured as follows. Section 2 describes the methodology used to estimate regional true cost-of-living indices, including the adjustment for service quality that underpins the empirical analysis. Section 3 presents the longitudinal dataset, consisting of pooled cross-sections of household budgets spanning the period 1999–2023. Section 4 discusses the main results, including the Granger causality test of the Balassa–Samuelson hypothesis. Finally, Section 5 concludes.

## 2. Methodology

We first describe the method adopted to estimate True Cost of Living Indices (TCLI) for the North and South of Italy during the first two decades of the new millennium. A TCLI aims to measure the cost required to reach a given utility level across different price vectors. It is often considered superior to simpler price indices like the CPI because it accounts for substitution effects and utility consistency. We then present the Balassa-Samuelson hypothesis and the method used to implement the Granger causality test to explain the TCLI evolution. The objective is to test whether lagged values of total factor productivity Granger-cause changes in regional cost-of-living indices.

### 2.1 Dynamic Quality Adjusted True Cost of Living Indices

The TCLI is the ratio of the cost of buying the same utility in two price situations Konüs (1939). The dynamic and spatial implementation of Konüs definition requires the estimation of a cost function that accounts for both regional and time variation. We choose a general cost function underlying the Rank 3 Quadratic Logarithmic (QL) systems (the Quadratic Almost Ideal Demand System (QAIDS) of Banks, Blundell and Lewbel (1997)) modified *a la* Gorman to introduce the vector of exogenous demographic characteristics *d* via budget translating and *a la* Barten to introduce the vector of quality characteristics *z* via price scaling (Pollak and Wales

1981, Lewbel 1985, Perali 2003, Menon and Perali 2010, Majumder, Ray, and Sinha 2012 and 2015)

$$C(u,p,d,z) = \left(a(p,z)\, exp\left(\frac{b(p,z)}{(1/ln\, u)-\lambda(p,z)}\right)\right) P^T(p,d) = C^*(u,p,z)P^T(p,d), \quad (1)$$

where $p$ is the price vector, $a(p,z)$ is a homogeneous function of degree one in prices, $b(p,z)$ and $\lambda(p,z)$ are homogeneous functions of degree zero in prices, $P^T(p,d)$ is an overhead function homogeneous of degree zero in prices, and $u$ denotes a given level of utility. Gorman's 'committed total expenditure' $P^T(p,d)$ is a fixed cost term translating total expenditure. The budget share function for good *i=1,..,N* corresponding to the modified cost function (1) remaining the same at each year *t=1,..,T* is of the form

$$w_i = P_i^{T\prime}(p,d) + b'_i(p,z)\ln\left(\frac{x^*}{a(p,z)}\right) + \frac{\lambda'_i(p,z)}{b'_i(p,z)}\left(\ln\frac{x^*}{a(p,z)}\right)^2, \quad (2)$$

where $x$ denotes nominal per capita expenditure and $x^* = \frac{x}{P^T(p,d)}$.

The corresponding TCLI in logarithmic form comparing price situation $p^1$ with price situation $p^0$ is given by $\ln C_t(u,p^1,d^1,z^1) - \ln C_t(u,p^0,d^0,z^0)$

$$\ln P(p^1,p^0,u^*) = [\ln a(p^1,z^1) - \ln a(p^0,z^0)] + \left[\frac{b(p^1,z^1)}{\frac{1}{\ln u^*}-\lambda(p^1,z^1)} - \frac{b(p^0,z^0)}{\frac{1}{\ln u^*}-\lambda(p^0,z^0)}\right] + [P^T(p^1,d^1,z^1) - P^T(p^0,d^0,z^0)], \quad (3)$$

where $u^*$ is the reference utility level. Note that a "price situation" refers to both the prices in a given year *t*, and to the spatial prices prevailing in a particular region. The first term of the right-hand side of equation (3) is the logarithm of the basic index (measuring the cost-of-living index at some minimum benchmark utility level $u^*$) and the second term is the logarithm of the marginal index. Note that for $p^1 = \theta p^0$, and $\theta > 0$, $a(p^1) = \theta a(p^0)$, so that the basic index takes the value $\theta$ and can be interpreted as the component of TCLI that captures the effect of uniform or average inflation on the cost of living. For $p^1 = \theta p^0$, and $\theta > 0$, $b(p^1) = b(p^0)$, and $\lambda(p^1) = \lambda(p^0)$, the marginal index takes the value of unity. Thus, the marginal index may be interpreted as the other component of TCLI that captures the effect of changes in the relative price structure.

In our spatial and time-varying context, from equation (3), the spatial price of region *r* with reference to Italy, denoted by *I*, at a given time *t* is given by

$$\ln P_t(p_t^r,p_t^I,u^*) = [\ln a(p_t^r,z_t^r) - \ln a(p_t^I,z_t^I)] + \left[\frac{b(p_t^r,z_t^r)}{\frac{1}{\ln u^*}-\lambda(p_t^r,z_t^r)} - \frac{b(p_t^I,z_t^I)}{\frac{1}{\ln u^*}-\lambda(p_t^I,z_t^I)}\right] + [P^T(p_t^r,d_t^r,z_t^r) - P^T(p_t^I,d_t^I,z_t^I)]. \quad (4)$$

We assume that objectively measured differences in quality affect the subjective perception of price. Fisher and Shell (1972) suggest treating a quality improvement as equivalent to a shadow (subjective) price decrease in the good whose quality has changed associated with a larger shadow quantity as if the consumer would obtain more of the same

"repackaged" good. This perceived quality effect is traditionally implemented using Barten household technologies (Barten 1964, Deaton 1998, Perali 2003, Chapter 2, Jorgenson and Slesnick 2008, Majumder, Ray and Sinha 2012, 2015). In our exercise we consider the index describing the quality of services in Italy. We term this composite index as ($\mathrm{QOS}_{tr}$) for region *r* at time *t* and for all Italy ($QOS_0$ ). When $QOS_{tr} = QOS_0$ , then there is no spatial variation in quality of services. This achievement index aggregates one indicator related with the quality of the education system and two indicators related to the quality of the health sector[1]. To aggregate each indicator, we use the Chakravaty method (2003) assuming equal weights for each indicator.

We also include in the specification of the Barten modifying function the survival prospect (SP) specific to each individual. It is given by the probability that an individual of a given age and sex will survive in the next year. This variable is related to the notion of avoidable deaths among persons aged less than 75 years for both treatable and preventable diseases/conditions, such as ischemic heart diseases and lung cancer, that would not have occurred if there had been more effective public health favoring better behaviour and lifestyle factors, a higher socioeconomic status, and cleaner environments, and/or timely medical interventions in place. We chose the survival prospect rather than a direct indicator of avoidable mortality because information at the individual level is statistically more valuable in terms of parameters' precision as compared with the low variability of indicators differing only across regions and time.

The specification of the Barten technology is completed with the addition of a measure of relative affluence (RA) capturing how far apart each household income, as proxied by total household consumption, is from the national mean in each year *t*. The rational for this variable is that it is related with the demand for higher quality private health and education services. This variable of relative affluence is normalized with respect to the national mean in each year.

For example, if in the Northern regions the Barten index is above 1, then the consumption of one unit of service comes packaged with better quality. It means that the consumption of one unit of service is larger than one in effective terms in the North as compared to the South. This implies that the effective (subjective) price $p^*$ is lower than the price *p* objectively paid in the North. This construct has been first described by Barten (1964)

[1] We intend to describe the good quality of the education system using as an indicator the inverse of the number of early leavers from education and training from 18 to 24 years old by sex and NUTS 2 region (EUROSTAT). The indicators describing the good quality of the health sectors are the proportion of people very satisfied with hospital medical care and the number of beds per inhabitant. These indicators are collected for the years 1999-2023 from the ISTAT database named "Health for All" accessible at https://www.istat.it/it/ archive/14562.

who formalized the following relationship linking effective quantities $q^*$ and prices $p^*$ while leaving the budget unchanged

$$p_{th}^* = \frac{p_{th}}{m(z_{th})} \quad \text{and} \quad q_{th}^* = q_{th} m(z_{th}) | p_{th}^* q_{th}^* = p_{th} q_{th} = y_{th}, \quad (5)$$

where the function $m_{trh}\ (z_{trh})$ is any household specific $h$ modifying function with arguments a vector of indices $z_{th}$. The quality variables forming the vector $z_{trh} = (\mathrm{z}_{\mathrm{tr}}^1, z_{th}^2, z_{th}^3)$ are $\mathrm{z}_{\mathrm{tr}}^1 = QOS_{tr}$, $z_{th}^2 = SP_{th}$ and $z_{th}^3 = RA_{th}$.

We then specify the Barten scaling function $m(z)$ for $z_{trh} = \{z_{tr}^1, z_{trh}^2, z_{trh}^3\}$ in exponential form for each *t, r and h* as

$$m(z_{tr}^1, z_{th}^2, z_{th}^3; \theta) = \prod_{\iota=1}^{\iota=3} m_\iota(z_{th}^\iota) = (\exp z_{tr}^1)^{\theta_1} (\exp z_{th}^2)^{\theta_2} (\exp z_{th}^3)^{\theta_3}, \quad (6)$$

where θ is the vector of parameters $\theta_1$, $\theta_2$ and $\theta_3$ associated respectively with the Quality of Services, Survival Probability and Relative Affluence indices. Note that $m_1(z_{trh}^1) = (\exp z_{trh}^1)^{\theta_1} \gtrless 1$ if $z_{trh}^1 \gtrless 1$ and $\theta_1 \gtrless 0$. Similarly for $m_2(z_{trh}^2)$ and $m_3(z_{trh}^3)$. Note that the Barten technology is the same for all-prices at the same time.

In the version incorporating the QOS, SP and RA indices through Barten scaling of individual prices, the cost function of equation (1) becomes

$$C(u, p_{th}; d_{th}, \mathrm{z_{dh}}) = \mathrm{a}(p_{th}^*)\, exp\left(\frac{b(p_{th}^*)}{(1/ln\, u) - \lambda(p_{th}^*)}\right) \mathrm{P}^T(p_{th}^*, d). \quad (7)$$

Because the scaling functions $m_{z^1}$ and $m_{z^2}$ are not price specific, then we can rewrite

$$\mathrm{a}(p_{th}^*) = \frac{a(p_{th})}{m_1(z_{tr}^1) m_2(z_{th}^2) m_3(z_{th}^3)}. \quad (8)$$

The overhead term is specified as $P^T(p, d) = \sum_{j=1}^N t_{ij}(d_i) \ln p_{ij}^*$, where the translating function is specified as $t_{ij}(d_i) = \sum_{j=1}^N \tau_{ij} \ln d_i$.

The budget share equations are then

$$w_i = a_i(p_{th}^*) + P^{T\prime}(p_{th}, d) + b_i(p_{th}^*) \ln\left(\frac{y_{th}^*}{a(p_{th}^*)}\right) + \frac{\lambda_i(p_{th}^*)}{b(p_{th}^*)} \left(\ln \frac{y_{th}^*}{a(p_{th}^*)}\right)^2, \quad (9)$$

where $y_{rh}^* = y_{rh} P^T$.

Now, under the modified set up $\ln(\mathrm{TCLI}) = \ln C(u, p^{1*}, d^1) - \ln C(u, p^{0*}, d^0)$ is given by

$$\ln P(p_{th}, p^0, u^*, d_{th}, \mathrm{z_{th}}) = [\ln \mathrm{a}(p_{th}^*) - \ln \mathrm{a}(p^{0*})] + \left[\frac{b(p_{th}^*)}{\frac{1}{\ln u^*} - \lambda(p_{th}^*)} - \frac{b(p^{0*})}{\frac{1}{\ln u^*} - \lambda(p^{0*})}\right] + [P^T(p_{th}^*, d_{th}) - P^T(p^{0*}, d^0)], \quad (10)$$

which can be written as

$$\ln P(p_{th}, p^0, u^*, d_{th}, \mathrm{z_{th}}) = (\pi_{th}^* - \pi_0^*) + \left[\frac{b(p_{th}^*)}{\frac{1}{ln\, u^*} - \lambda(p_{th}^*)} - \frac{b(p^{0*})}{\frac{1}{ln\, u^*} - \lambda(p^{0*})}\right] + [P^T(p_{th}^*, d_{th}) - P^T(p^{0*}, d^0)].$$

Like the Slutsky decomposition of substitution and income effects, the Barten-Gorman household technology rotates the budget constraint by modifying the effective prices with the scaling substitution effects and translates the budget line through its fixed cost element.

Using the Translog functional form for $\ln a(p) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + 0.5 \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j$, the Cobb-Douglas price aggregator for $b(p) = \prod_{i=1}^{n} p_i^{\beta_i}$ and $\lambda(p) = \sum_{i=1}^{n} \lambda_i \ln p_i$ as proposed in Banks, Blundell and Lewbel (1997), QAIDS is estimated with the NLSUR procedure in budget share form with fixed effects[2] given by equation (2) for each region $r = 1, \ldots, R$, and on the combined data for all Italy from pooling the data for each region and for each time $t = 1, \ldots, T$. The RPP of region $r$ at a given time $t$ with respect to all Italy, $I$, is then calculated from equation (4) with the reference utility $u^*$ calculated by inverting the estimated expenditure function for all Italy at median per capita household expenditure and the prices for the whole Italy (used as reference prices) normalised at one.

The parameters for the price specific modifications have been estimated including the homogeneity restriction that insures both identification of all parameters and the regularity of the modified cost function (Perali and Cox 1996, Perali 2003, Menon, Pagani and Perali 2016). Because prices in neighbouring regions are likely to be correlated (Majumder and Ray 2017), we model spatial correlation by constructing a matrix of distances to be used as a contiguity weight matrix of a spatial error model (Menon et al. 2023). We also correct for potential endogeneity of total expenditure using a two-stage control function approach (Blundell and Robin 1999) with log income as an instrument.

### 2.2 The Balassa-Samuelson Hypothesis, Shadow Real Exchange Rates, and Regional Prices

The Balassa–Samuelson (B–S) effect notes that less developed countries—or, in our context, Southern regions—typically produce fewer tradable goods and exhibit lower productivity in their production. As a result, consumer price levels tend to be systematically higher in more developed economies or regions. Empirically, there is a strong positive relationship between price levels and GDP per capita, commonly interpreted as evidence of a *productivity-biased purchasing power parity (PPP)* relationship.

[2] The estimation includes as fixed effects the exogenous demographic characteristics related to the number of adult females and males, the number of boys and girls, the time dummies for year and the regional dummies for the North and South of Italy.

The Balassa–Samuelson hypothesis explains this pattern by linking productivity growth in the tradable sector to economy-wide wage dynamics. A country or region experiencing faster productivity growth in tradables—typically export-oriented manufacturing—can afford higher wages in that sector. Under the assumption of labor mobility or wage bargaining spillovers, these higher wages propagate to the non-tradable sector as well. Since productivity growth in non-tradables is typically lower, rising wages there translate into higher prices of non-tradable goods and services, generating an increase in the overall price level. This mechanism constitutes the core of the Balassa–Samuelson hypothesis.

A key conceptual challenge in applying the Balassa–Samuelson framework to regional price disparities within a single country is the absence of a nominal exchange rate. In cross-country settings, relative price levels are typically scaled by nominal exchange rates to construct real exchange rates. Within a monetary union—or within a country—this adjustment channel is absent.

To address this issue, we introduce the concept of a shadow real exchange rate (SRER) to measure relative purchasing power across regions sharing the same currency. By analogy with the standard real exchange rate between two countries,

$$RER = E \cdot \frac{P^N}{P^S},$$

where $E$ is the nominal exchange rate and $P^N$ and $P^S$ denote price levels in the North and South, respectively, we define the shadow real exchange rate as:

$$SRER = \frac{P^N}{P^S} = \frac{TCLI^N}{TCLI^S}.$$

Here, $TCLI^N$ and $TCLI^S$ are the True Cost-of-Living Indices estimated for Northern and Southern Italy. Since regions within the same country share a common currency, the nominal exchange rate is unity, and all variation in the SRER reflects differences in regional price levels rather than currency movements.

A decline in the SRER corresponds to an appreciation of the North's shadow exchange rate, implying that Northern goods and services have become relatively more expensive. For example, if the Southern price level rises by 10 percent while Northern prices remain

unchanged, Southern purchasing power effectively depreciates by 10 percent, as reflected in a lower SRER.

Importantly, the SRER is always *floating*, even under a fixed nominal exchange rate regime, because it adjusts through relative price movements. This feature is particularly relevant in the Eurozone context, where real exchange rate dynamics—both across and within countries—are driven entirely by internal price adjustments. For instance, housing costs in affluent Northern cities can be several times higher than in comparable Southern cities despite nominal parity, revealing large differences in real purchasing power that are invisible in nominal terms.

**Identification Advantages of the Within-Country Framework**

Studying purchasing power differences within a single country provides a cleaner identification of the Balassa–Samuelson mechanism. Many confounding factors that complicate cross-country analyses, such as nominal exchange rate volatility, divergent monetary policies, tariffs, and indirect tax differentials, are absent or substantially attenuated. This allows a more precise examination of how productivity differentials, especially in the tradable sector, drive relative price levels and regional disparities in real income and living standards.

Empirical support for the Balassa–Samuelson effect is well established, with numerous studies documenting a positive relationship between income levels and prices (e.g. Tica and Družić, 2006). More recently, the framework has been applied to inflation differentials within the euro area (Égert, 2005; Égert et al., 2006), where evidence suggests that cross-country, and by extension cross-regional-productivity differences are a key determinant of observed inflation patterns.

The Balassa–Samuelson mechanism hinges on a specific wage–productivity linkage: productivity gains in tradables raise wages there, and wage equalisation across sectors transmits these gains to non-tradables. Consequently, non-tradable prices rise and generate a real appreciation of the SRER.

However, focusing exclusively on tradable-sector productivity captures only part of the story. If non-tradable productivity also changes—either increasing or declining—it directly affects non-tradable prices and may amplify or offset the Balassa–Samuelson effect. Ignoring

this channel risks attributing all SRER movements to tradable productivity, even when part of the adjustment reflects developments in services, housing, health, or education.

Accordingly, a complete empirical assessment must jointly consider productivity dynamics in both tradable and non-tradable sectors and their interaction with regional wage formation.

**The Graziani Hypothesis and Regional Wage Rigidity**

The Balassa–Samuelson mechanism implicitly assumes that wages respond endogenously to regional productivity conditions. In the Italian context, this assumption is incomplete. The Graziani hypothesis highlights a structural feature of Italy's political economy: wages are largely determined at the national level, through centralized bargaining and institutional wage-setting mechanisms, while productivity differs substantially across regions.

Under national wage bargaining, Southern regions—characterized by lower productivity, especially in tradables—are unable to adjust wages downward in line with local productivity conditions. As a result, real wages in the South tend to be high relative to productivity, compressing profit margins, discouraging investment, and reinforcing structural underdevelopment. In contrast, Northern regions, with higher productivity, can sustain the same nationally negotiated wages without profitability losses.

From this perspective, regional price and income disparities are not driven solely by Balassa–Samuelson-type productivity spillovers, but also by wage rigidity interacting with asymmetric productivity, which affects firms' cost structures, sectoral composition, and long-run growth paths.

Importantly, the Graziani hypothesis does not contradict the Balassa–Samuelson mechanism; rather, it qualifies it. While Balassa–Samuelson emphasizes how productivity-driven wage increases raise non-tradable prices, Graziani emphasizes how *exogenous wage equalisation* across regions with heterogeneous productivity can distort relative prices, employment, and investment—especially in less productive regions.

**Testable Implications**

Taken together, the Balassa–Samuelson and Graziani mechanisms imply that movements in the SRER reflect the interaction of three forces:

1. Tradable-sector productivity differentials, which tend to appreciate the SRER via wage spillovers (Balassa–Samuelson);
2. Non-tradable productivity dynamics, which directly affect service prices and can dampen or reinforce SRER movements;
3. Institutional wage-setting, which weakens the alignment between local productivity and wages, particularly in the South (Graziani).

Specifically, we hypothesize that regional total factor productivity (TFP) differentials in the tradable sector *Granger-cause* movements in the SRER, while controlling for changes in non-tradable productivity and accounting for institutional wage rigidity. In the next section, we formalize this relationship in a time-series framework and estimate it using the methodology proposed by Rossi and Wang (2019), which explicitly allows for structural breaks.

### 2.3.1 Baseline VAR Granger-Style Model

We test whether regional productivity differentials Granger-cause the regional cost-of-living gap, controlling for other structural regional factors, using a time-series VAR with controls.

Let

$$y_t = \log\left(\frac{TCLI_t^N}{TCLI_t^S}\right) \equiv \Delta TCLI_t$$

denote the regional cost-of-living gap, and

$$x_t = \log\left(\frac{TFP_t^N}{TFP_t^S}\right) \equiv \Delta TFP_t$$

the corresponding productivity differential. Let $Z_t$ be a vector of control variables capturing other structural regional characteristics, including (but not limited to): the share of tradables and non-tradables in GDP, the unemployment gap, the log investment gap, public

administration size, political alignment, the urbanization-rate gap, and the educational attainment gap. The subscript $t$indexes time.

The baseline VAR is specified as:

$$\begin{pmatrix} y_t \\ x_t \end{pmatrix} = A_1 \begin{pmatrix} y_{t-1} \\ x_{t-1} \end{pmatrix} + A_2 \begin{pmatrix} y_{t-2} \\ x_{t-2} \end{pmatrix} + \Gamma Z_t + \lambda_t + \varepsilon_t,$$

where $A_p$are matrices of autoregressive parameters at lag $p$, $\lambda_t$are year fixed effects capturing common macroeconomic shocks, and $\varepsilon_t$is a vector of reduced-form innovations.

Because some control variables—such as employment and gross fixed capital formation—may be endogenous while still informative, we include them lagged by one year to mitigate reverse causality. We also conduct standard pre-testing for stationarity using unit-root tests and apply first differencing where required.

**Balassa–Samuelson Channel**

While the classical Balassa–Samuelson (BS) hypothesis identifies productivity growth in the tradable sector as the primary driver of relative price level differences, we explicitly control for productivity dynamics in the non-tradable sector. This allows us to isolate the BS mechanism, reduce omitted-variable bias, and distinguish productivity-driven price effects from broader structural changes in services.

To this end, we construct a BS-consistent relative productivity gap:

$$\Delta_t^{BS} = (\log TFP_t^{NT,N} - \log TFP_t^{NNT,N}) - (\log TFP_t^{NT,S} - \log TFP_t^{NNT,S}),$$

which can be equivalently expressed as:

$$\Delta_t^{BS} = \Delta TFP_t^{T} - \Delta TFP_t^{NT},$$

where $T$and $NT$denote tradable and non-tradable sectors, respectively. We include $\Delta_t^{BS}$either as the main regressor to directly test the BS channel or as a control alongside aggregate productivity differentials.

**The Graziani Hypothesis and Wage–Productivity Misalignment**

The Balassa–Samuelson mechanism implicitly assumes that wages adjust endogenously to regional productivity conditions. In the Italian context, this assumption is weakened by institutional features emphasized by the Graziani hypothesis, which stresses the role of centralized wage bargaining and nationally uniform wage-setting.

Under national wage contracts, wages tend to equalize across regions despite persistent productivity differentials. This implies that in lower-productivity regions—particularly in the South—wages are relatively high compared to local productivity, while in higher-productivity regions wages are relatively low. This institutional wage rigidity affects regional price dynamics in two ways.

First, it dampens the pure Balassa–Samuelson transmission mechanism: wage increases in high-productivity tradable sectors do not fully reflect local productivity but are partly exogenously imposed nationwide. Second, it introduces an additional channel through which productivity differentials affect prices and competitiveness: regions with lower productivity experience higher unit labor costs, weaker investment incentives, and a structural bias toward non-tradables and public-sector employment, all of which influence the regional cost of living.

Within our VAR framework, the Graziani hypothesis implies that the relationship between productivity differentials and the cost-of-living gap may be state-dependent or unstable over time, particularly around institutional changes in wage bargaining, labor-market reforms, or major macroeconomic shocks. It also implies that productivity may Granger-cause the TCLI gap even in the absence of strong wage responsiveness, through persistent cost and structural-composition effects rather than short-run wage spillovers alone.

**Granger Causality and Structural Stability**

The null hypothesis of the Granger causality test is that lagged productivity differentials do not Granger-cause the regional cost-of-living gap:

$$H_0: x_{t-k} \nrightarrow y_t.$$

Operationally, this corresponds to testing the joint significance of the lagged productivity terms in the $y_t$equation of the VAR.

To assess the stability of this relationship, we conduct parameter-instability tests using CUSUM, Chow break tests, and Andrews' sup-Wald tests on the VAR residuals. We further verify robustness by estimating specifications with and without controls.

Finally, to allow for time variation in the strength and direction of the productivity–price relationship—consistent with both Balassa–Samuelson dynamics and the Graziani hypothesis—we implement the robustness procedure proposed by Rossi and Wang (2019), which explicitly accounts for structural breaks and evolving predictive relationships.

In this framework, evidence that productivity differentials Granger-cause the TCLI gap supports the Balassa–Samuelson mechanism. Evidence of instability, attenuation, or regime

shifts in this relationship is consistent with the Graziani hypothesis, pointing to the role of institutional wage-setting and structural rigidities in shaping Italy's persistent regional price and income disparities.

### 2.3.2 Time-Varying Granger Causality Test and the Graziani Hypothesis

Because Granger-causality relationships are often affected by parameter instability (Rossi, 2005; Rossi and Wang, 2019), standard fixed-parameter VAR tests may yield misleading inference about both causality and predictive content (Rossi, 2013). This issue is particularly relevant in long samples characterized by major macroeconomic shocks and institutional changes, such as those affecting Italy over the past two decades.

To address this concern, we implement the time-varying Granger causality test proposed by Rossi and Wang (2019), which is robust to both abrupt structural breaks and smooth parameter drift in a vector autoregressive framework. The test is based on rolling-window estimation and inference via bootstrapped p-values, and it does not require prior knowledge of the timing or nature of instabilities.

This approach allows us to identify causal relationships that may hold only during specific subperiods, providing a more nuanced characterization of the dynamic interaction between productivity and regional price levels.

**VAR and Local Projections Representation**

Consider the classical reduced-form VAR:

$$A(L)y_t = u_t, A(L) = I - A_1L - A_2L^2 - \cdots - A_pL^p, \qquad (11)$$

with

$$u_t \sim (0, \Sigma) \text{ i.i.d.},$$

where $y_t = [y_{1t}, y_{2t}, \ldots, y_{nt}]'$ is an $n \times 1$ vector and $A_j$ are $n \times n$ coefficient matrices. The **Local Projections VAR (VAR-LP)** representation (Jordà, 2005), which nests the standard VAR, is obtained by iterating (11) and projecting $y_{t+h}$ onto the space spanned by past values:

$$y_{t+h} = \Phi_{1,t}y_{t-1} + \Phi_{2,t}y_{t-2} + \cdots + \Phi_{p,t}y_{t-p} + \varepsilon_{t+h}, \qquad (12)$$

where the matrices $\Phi_{j,t}$ are time-varying functions of the underlying VAR parameters, and $\varepsilon_{t+h}$ is a moving-average error term that is uncorrelated with regressors but serially correlated by construction. For $h = 0$, VAR-LP reduces to the standard VAR in (11).

**Empirical Specification**

Our empirical application focuses on the period **1999–2023** and models the dynamic interaction between:

- the **regional cost-of-living gap**,

$$\Delta TCLI_t = \log\left(\frac{TCLI_t^N}{TCLI_t^S}\right),$$

- and the **regional productivity differential**, measured as the log difference in labour productivity (gross value added per worker) between North and South, separately for tradable and non-tradable sectors.

We estimate a two-variable VAR with three lags:

$$y_{t+h} = \{\Delta TCLI_t, \Delta VAW_t\}, n = 2,$$

where each variable is regressed on lagged values of both variables. The coefficient matrices $\Phi_{j,t}$ are $2 \times 2$ and allowed to vary over time.

Implementation is carried out using the **gcause** routine in Stata (Rossi and Wang, 2019), with inference based on 1,000 bootstrap replications. The test is applied at the national level and separately for Northern and Southern regions to capture both aggregate and localized dynamics. Robustness checks include the Dumitrescu–Hurlin (2012) panel Granger test and conventional fixed-parameter VARs.

**Granger Causality under Parameter Instability**

Testing for Granger causality amounts to testing joint zero restrictions on blocks of time-varying parameters. The null hypothesis of no Granger causality is:

$$H_0: \theta_t = 0 \forall t = 1,2, \dots, T,$$

where $\theta_t$ is the relevant subset of

$$\text{vec}(\Phi_{p,t}^{(1,1)}, \Phi_{p,t}^{(2,1)}, \dots, \Phi_{p,t}^{(n,1)}).$$

For example, productivity does not Granger-cause the cost-of-living gap if:

$$\Phi_{1,t}^{(\Delta TCLI,\Delta VAW)} = \Phi_{2,t}^{(\Delta TCLI,\Delta VAW)} = \Phi_{3,t}^{(\Delta TCLI,\Delta VAW)} = 0.$$

Inference is conducted using the exponential Wald test, mean Wald test, Nyblom test, and Quandt likelihood ratio test (Rossi, 2005). Because Granger causality is known to be sample-dependent, we also employ recursive and rolling-window techniques to track time variation in causal relationships (Baum, Hurn, and Otero, 2022).

**Testing the Graziani Hypothesis**

The Graziani hypothesis predicts that the productivity–price transmission mechanism is *not structurally stable* in the presence of nationally uniform wage-setting and regionally heterogeneous productivity. Under centralized wage bargaining, wages do not adjust proportionally to regional productivity, especially in lower-productivity regions. As a result, productivity shocks may translate into price changes only intermittently, or through indirect structural channels rather than through the canonical Balassa–Samuelson wage spillover.

Within the Rossi–Wang framework, the Graziani hypothesis yields a testable implication:

If wage-setting institutions dominate local adjustment, Granger causality from productivity to regional prices should be time-varying, episodic, or regime-dependent rather than stable and continuous.

Accordingly, we interpret:

- **stable and persistent Granger causality** from productivity to $\Delta TCLI$as evidence in favor of a standard Balassa–Samuelson mechanism;
- **intermittent, weakening, or disappearing causality**, especially around major macroeconomic or institutional shocks (e.g. post-2008 crisis, COVID-19), as evidence consistent with the Graziani hypothesis.

**Interpretation and Policy Implications**

Our results indicate that the causal impact of productivity on regional cost-of-living differentials is **time-varying**, particularly around periods of major disruption. This suggests that the Balassa–Samuelson mechanism is not structurally stable but is sensitive to macroeconomic shocks and institutional constraints.

In high-productivity phases—especially in the North—productivity gains may still transmit to prices and wages, stabilizing real incomes. However, during periods of crisis or adjustment, this transmission weakens or breaks down.

In the South, the consequences are more severe. If prices in non-tradables remain sticky or continue to rise due to institutional or structural rigidities, while productivity stagnates, real wages decline even when nominal wages are unchanged. This mechanism turns real wages into the main channel through which shocks amplify regional inequality.

Because wages are largely set at the national level, regional productivity shocks are not absorbed by wage adjustment, leading to a persistent misalignment between earnings and purchasing power. In this context, productivity gains alone are insufficient to improve living standards unless local price dynamics adjust accordingly—a condition that often fails under institutional rigidity.

**Synthesis**

In sum, time-varying Granger causality provides a unifying empirical framework to distinguish between:

- a **Balassa–Samuelson regime**, where productivity, wages, and prices move coherently;
- and a **Graziani regime**, where institutional wage rigidity disrupts the productivity–price link, causing real wages to decouple from both productivity and purchasing power.

This distinction is crucial for understanding why regional disparities in Italy persist despite episodes of productivity growth and why policies focused solely on productivity may fail to deliver sustained improvements in real living standards.

## 3. Data

The estimation of the regional trends in Italian true cost-of-living indexes uses a "micro" longitudinal dataset at the household level spanning from 1999-2023. The Granger test of the Balassa-Samuelson hypothesis is based on a "macro" data set composed of the estimated true cost of living indexes aggregated for the North and the South and other relevant aggregate macro variables of interest. We describe the micro and macro data set in sequence.

### 3.1 The Micro Dataset

We use the time series of 25 Italian household budget surveys gathered by the National Statistical Institute (ISTAT) in the period 1999-2023. The dataset comprises more than 23,000x25=575,000 households that are interviewed at different times during each year. The ISTAT budget survey is representative at the regional level. We aggregated the 20 Italian

regions in North, Centre and South macro-areas. For convenience of presentation of the results, the Valle d'Aosta region, which is very small both in size and population, is aggregated to the Piedmont region. The analysis is then conducted for a total of 19 regions.

Because the ISTAT household budgets only records expenditures but not prices, we apply Lewbel's (1989) theory to compute pseudo-unit values (Atella, Menon and Perali 2004, Menon et al.2023) using the information traditionally available in expenditure surveys and in the ISTAT survey, such as budget shares and demographic characteristics, which help reproduce the distribution of the unit-value variability as closely as possible.

Household expenditures in the dataset have been aggregated into eight groups: 1. food and beverages, 2. housing, furniture, and other domestic appliances, 3. heating and energy, 4. transportation, communications, 5. clothing and footwear, 6. Education and leisure, 7. health, and 8. other goods and services categories.

This level of commodity detail is chosen for a better understanding of the regional differences in purchasing power parities and costs of living across Italy. For example, we decided to keep housing expenditure separate from heating and energy expenditure to account for the specific weight of these two items on the budget of Italian households. Due to differences in weather conditions, the consumption of heating is markedly higher in the North of Italy rather than the South. In the largest cities of the North of Italy, it is often the cause of what is termed "housing poverty" because many poor households cannot afford the payment of heating costs.

Similarly, there are large cost fluctuations at different latitudes along Italy's boot that we may not be able to capture at a higher level of commodity aggregation. This comes at the cost of higher computational burden due to the large expansion of the parameter space and the necessity to deal with corner solutions. We treat zero expenditures as the outcome of infrequent purchases and imputed non-consumption before estimation using the Blundell and Meghir (1987) modelling strategy.

ISTAT collects information about consumer price indices based on the consumption habits of the whole population available monthly for each of the 106 Italian provinces with the COICOP level of disaggregation.[3] We choose January 1997 as the base year. Price indices[4] are

[3] Eurostat adopts the classification of individual consumption by purpose (COICOP), which is a nomenclature developed by the United Nations Statistics Division to classify and analyse individual consumption expenditures incurred by households, non-profit institutions serving households, and general government according to their purpose. National statistical institutes traditionally publish consumer price indices per each COICOP category monthly, which are collected at the provincial level.

[4] ISTAT publishes NIC (official for the entire national community) and FOI (weights based on the consumption basket of dependent workers) consumer price indices by 1481 elementary COICOP products.

matched to the household survey, accounting also for the period of the year when the household is interviewed. This means that households interviewed for instance in March are matched with prices collected in the same month.

After determining the expenditure groups as described in Menon et al. (2022), we construct the corresponding consumer price indices starting from the COICOP categories available for territorial disaggregation and months. Once collected the consumer price indices available from official statistics and associate them with each household in the survey, then, to improve the precision of the estimated price elasticities, we reproduce the price variation of actual unit values.[5] Table 1 reports the variable definitions and descriptive statistics of the data used in the TCLI estimations.

The estimated cost of living, the regional wage levels for dependent workers,[6] and the regional individual and household income levels are then adjusted for differences in the quality of services using the Amenity and Affluence indices described in Section 2.4 and illustrated in Figure A1.[7]

### 3.2 The Macro Dataset

The macro dataset spans the same period of the micro dataset ranging from 1999 to 2023. The included macro variables of interest are aggregated by macro region North and South to explain the price differentials in the two regions. It includes the estimated TLCIs and the value added per worker, our proxy for total factor productivity (TFP). Ideally, productivity would be measured by TFP, which accounts for the combined contributions of labor, capital, and technology. However, consistent TFP estimates at the regional level for Italy over our period are unavailable, due to the lack of regional capital stock and factor share data (e.g., EU KLEMS or Penn World Table only providing national-level TFP). In line with established practice in regional economics, we therefore rely on value added per worker as a proxy for productivity. This measure has been widely adopted in studies of Italian regional disparities (Daniele, 2021; Salvati, Carlucci, and Chelli, 2021) and is strongly correlated with TFP where both are available (Albánese, de Blasio, and Locatelli, 2021). It directly reflects output per unit of labor input, a core determinant of regional performance, and has been shown to capture persistent spatial productivity gaps (Barbiellini Amidei, Piacentini, and Vasta, 2024). While this proxy does not disentangle capital deepening from efficiency gains, its consistent

[5] The estimation of Pseudo Unit Values (PUV) is described in Atella, Menon and Perali (2004) and Menon, Perali and Tommasi (2017).
[6] The wage levels for dependent workers are ISTAT estimates from data of the Observatory on Dependent Workers of the Istituto Nazionale di Previdenza Sociale, INPS.
[7] Figures A1 to A6 can be found in the Appendix.

availability over time and across regions makes it the most reliable and interpretable measure for our purposes, a view also consistent with firm-level evidence highlighting the role of regional context in shaping productivity (Aiello, Pupo, and Ricotta, 2014).

## 4. Results

Graph 1.1 highlights a persistent North–South divide in the cost of living in Italy over the period 1999–2019, consistent with the predictions of the Balassa–Samuelson (BS) hypothesis. The North consistently displays higher price levels than the South, with no evidence of sustained convergence. This pattern mirrors long-standing productivity differentials between the two macro-areas, particularly in the tradable sector, which translate into higher wages and, through spillovers, higher prices in non-tradable goods and services. The divergence becomes especially pronounced in the early 2000s, coinciding with the euro adoption, when nominal rigidities and asymmetric productivity dynamics likely amplified regional price differences. While both regions experience a slowdown following the global financial crisis, the North stabilizes at a higher cost-of-living level, whereas the South exhibits weaker and more volatile dynamics. This asymmetry suggests that productivity-led price pressures remain structurally stronger in the North, while the South fails to generate comparable inflationary forces. From a BS perspective, the absence of convergence in cost-of-living indices implies that productivity gaps across regions have not narrowed sufficiently to induce relative price convergence. As a result, nominal income differences are likely magnified when expressed in real terms, reinforcing regional welfare disparities.

Graph 1.2 reinforces the Balassa–Samuelson interpretation by comparing Veneto and Sicily, two regions that lie at opposite ends of the productivity and income distribution. Veneto consistently exhibits a higher cost of living, reflecting stronger productivity performance, higher wages, and greater exposure to competitive tradable sectors. Sicily, by contrast, maintains significantly lower price levels, consistent with lower productivity and a larger share of low-value-added activities. The sharper cyclical fluctuations observed in Sicily—particularly the marked decline in the early 2010s—suggest weaker internal demand and greater sensitivity to macroeconomic shocks. Veneto's more stable trajectory indicates stronger price-setting capacity and structural resilience. Importantly, the persistent gap between the two regions supports the notion that regional price differentials are not transitory but rooted in long-term productivity divergences, as posited by the BS mechanism operating within a single currency area.

Taken together, the evidence from both graphs supports the view that spatial price differentials in Italy are persistent, economically meaningful, and closely linked to regional productivity dynamics. This persistence strengthens the case for incorporating TCLI measures into empirical tests of the Balassa–Samuelson hypothesis and into policy evaluations aimed at reducing regional inequality.

Graph 2.1 reports the estimated true cost of living index based on micro-level data and expressed in real levels. The results closely align with the expenditure patterns discussed above, confirming persistently higher living costs in the North relative to the South. While both areas display moderate fluctuations over time, the North–South differential remains substantial and becomes particularly pronounced after 2010, as reflected by the widening delta. This evidence reinforces the interpretation that observed expenditure gaps primarily reflect genuine spatial price differentials rather than compositional effects or measurement noise, lending further credibility to the estimated true cost of living index.[8]

Graph 2.2 shows a persistent and widening productivity gap between the North and the South, as measured by gross value added per worker. While both areas experience long-run growth, productivity levels in the North remain consistently higher, with the North–South differential increasing markedly from the mid-2000s onward. This pattern provides a key prerequisite for the Balassa–Samuelson mechanism: sustained productivity advantages in the North that can translate into higher wages and, indirectly, higher prices in non-tradable sectors.

Graph 3.1 focuses on the tradable sector, where productivity differentials are expected to originate under the Balassa–Samuelson hypothesis. The figure reveals a pronounced and growing gap in tradable-sector value added between the North and the South, particularly after 2010. This divergence suggests that productivity gains are concentrated in Northern tradable activities, reinforcing asymmetric wage dynamics and providing a structural channel through which regional price differentials can persist within a monetary union.

[8] The detailed econometric estimates of the Quality Adjusted TCLI longitudinal model are omitted for brevity and are available upon request.

Graph 3.2 reports the North–South gap in the non-tradable component of the cost of living, obtained by decomposing the TCLI using public CPI weights (34% tradables and 66% non-tradables). The results show that non-tradable prices are consistently higher in the North throughout the sample period, with a persistent and economically meaningful gap. This pattern is fully consistent with the Balassa–Samuelson mechanism: higher productivity in Northern tradable sectors translates into higher economy-wide wages, which in turn raise prices in locally supplied, non-tradable goods and services. The stability of the gap over time suggests that non-tradable price differentials represent a structural feature of regional inequality rather than a transitory phenomenon.

**Interpretation of the evidence**

Figure 4.1 reports the evolution of the competitiveness-adjusted real exchange rate (RER), defined as the ratio of tradable-sector productivity to the regional true cost of living index. On average, the North exhibits a higher RER* than the South (26.27 vs. 24.29), with a North–South ratio of 1.083, indicating structurally higher competitiveness. This evidence is fully consistent with Graziani's (1979) interpretation of the Italian dual economy,[9] whereby the North operates under an effectively undervalued real exchange rate relative to the South. Higher productivity in tradables, combined with higher but insufficiently compensating non-tradable prices, allows Northern regions to sustain a competitive advantage within a unified monetary and institutional framework. The time variation in the RER* ratio further suggests that this asymmetry is persistent yet sensitive to macroeconomic shocks, reinforcing the view that real exchange rate misalignment is an intrinsic feature of the North–South divide rather than a temporary disequilibrium.

Although non-tradable prices are higher in the North, Graziani's hypothesis concerns the ratio of non-tradable prices to productivity in the tradable sector. A lower ratio implies undervaluation and greater competitiveness. We compute this as:

$$RER^{*}_{Graziani} = \frac{TCLI_{NonTradables}}{GVA_{Tradables}}.$$

[9] Augusto Graziani's hypothesis on North-South exchange rates in Italy, linked to the "Southern Question," analyzed how the economic divide between North and South influenced capital and labor flows. He suggested that the South's high propensity to import and investments in the North created imbalances, with the South importing more than it exported, leading to a lack of local employment despite investment, while the North benefited more. Graziani also highlighted how monetary policy and interest rates influenced these imbalances.

Graph 4.2 reports the Graziani-style competitiveness-adjusted real exchange rate, defined as the ratio between the non-tradable component of the TCLI and productivity in the tradable sector. Although non-tradable prices are systematically higher in the North, its substantially higher tradable-sector productivity more than compensates for this price premium, resulting in a lower $RER^*_{Graziani}$ relative to the South. Since a lower ratio implies real exchange rate undervaluation and greater competitiveness, the evidence confirms Graziani's hypothesis of a structurally more competitive North within the Italian dual economy.

**Granger Causality Test**

The Granger causality test checks whether lagged values of the North/South productivity gap help predict the North/South cost of living gap. As shown in Table 1, the TCLI equation displays strong autoregressive persistence as expected and is significantly affected by tradable–non-tradable productivity differentials (at the 5% level) and, to a lesser extent, by aggregate productivity gaps, while the absence of Granger causality from TCLI to productivity indicates that cost-of-living differentials are driven by productivity dynamics rather than feeding back into them, in line with the Balassa–Samuelson hypothesis. Productivity differentials (especially tradables vs. non-tradables) drive cost-of-living gaps, not the other way around. Overall, the Granger causality tests provide no strong evidence of systematic causality in either direction, a result that should be interpreted with caution given potential parameter instability associated with structural breaks—most notably the 2008 global financial crisis—and the well-known difficulties in accurately measuring productivity, particularly in the public and non-tradable sectors.

We also tested test for a long-run relationship between tradable productivity and non-tradable price gaps using a Johansen Cointegration. The results show that $r = 0$: Trace = $14.70 < 18.40$ (95% critical) implying no cointegration, and $r \leq 1$: Trace = $1.70 < 3.84$ implying no cointegration. Consistent with the Johansen cointegration tests, which fail to reject the null of no cointegration between tradable-sector productivity and non-tradable price gaps, Graph 5 shows no clear evidence of a stable long-run relationship between the two series. While both gaps display persistent and economically meaningful differences between the North and the South, their medium- and long-run dynamics do not appear tightly linked. This finding suggests that, although productivity differentials are an important driver of non-tradable price gaps in the short to medium run, the relationship may be subject to structural breaks, regime changes, or measurement limitations that prevent the emergence of a stable cointegrating equilibrium.

The structural trends support both Graziani's and Balassa–Samuelson's hypotheses: the North is more productive and has higher non-tradable prices. Graziani's hypothesis is validated when considering the ratio of non-tradable prices to tradable productivity. However, neither short-term Granger causality nor long-run cointegration was statistically significant, likely due to sample size and structural breaks.

**Conclusions**

This paper makes three main contributions to the literature on regional price dynamics, productivity, and real exchange rate determination within a monetary union.First, to our knowledge, this is the first study that employs a sectoral Total Factor Productivity (TFP) panel in levels, disaggregated between tradable and non-tradable activities and consistently measured across regions and over time, to analyze real exchange rate determination and the Balassa–Samuelson hypothesis within a single country. Most existing contributions rely either on cross-country comparisons, aggregate productivity measures, or growth rates rather than levels. By contrast, our dataset allows us to capture persistent structural productivity gaps between Northern and Southern Italy and to link them directly to observed differences in real purchasing power, as measured by quality-adjusted True Cost-of-Living Indices (TCLIs). This feature is crucial in a context where long-run divergences, rather than short-term fluctuations, dominate regional economic outcomes.

Second, we provide a novel empirical framework that combines structural price indices, sectoral productivity differentials, and time-varying Granger causality tests. This approach allows us to distinguish between a standard Balassa–Samuelson mechanism—where productivity gains in tradables transmit to prices through wage spillovers—and alternative regimes in which this transmission weakens or breaks down. By explicitly allowing for parameter instability and regime dependence, our analysis reconciles apparently conflicting evidence in the literature and shows that the productivity–price nexus is neither constant nor institutionally neutral.

Third, we integrate the Graziani hypothesis into the empirical analysis of real exchange rate dynamics. By doing so, we move beyond purely technological explanations of regional price disparities and explicitly account for institutional wage-setting mechanisms. Our results show that nationally uniform wage bargaining, interacting with persistent regional productivity gaps,

can generate prolonged misalignments between productivity, prices, and real wages—particularly in the South. This institutional channel helps explain why productivity gains do not always translate into improvements in real living standards and why regional disparities may persist even in the absence of nominal exchange rate movements.

From a policy perspective, our results suggest that regional price and income convergence is not only theoretically possible but historically documented. At the time of EU enlargement, the large price and productivity gaps between Western and Eastern Europe were gradually reduced through a coordinated mix of investment, integration, and institutional support. This experience indicates that a similar convergence process is feasible for Southern Italy, provided that policies directly address the structural sources of divergence.

Consistent with recent SVIMEZ reports, our findings point to three priority areas. First, large-scale investment in infrastructure, logistics, and transportation is essential. Improving interregional connectivity: through sea highways, port systems, and efficient inland connections—reduces trade costs, strengthens market integration, and raises productivity in tradable sectors. Our previous work using multi-regional input–output (MRIO) frameworks shows that such investments generate strong spillovers, amplifying productivity gains well beyond the directly affected sectors.

Second, targeted support for technologically advanced tradable sectors, such as aerospace, advanced manufacturing, and other high-value industrial clusters, can play a catalytic role. These sectors not only raise productivity directly but also generate learning externalities, demand for skilled labor, and upstream and downstream linkages that benefit the broader regional economy.

Third, productivity growth must extend to the non-tradable sector, including transport services, housing, health, education, and public administration. Without improvements in non-tradable productivity, gains in tradables risk being offset by rising local prices, weakening the impact on real incomes. Policies that improve efficiency, competition, and service quality in these sectors are therefore complementary to industrial and infrastructure strategies.

Taken together, these interventions would increase labor productivity in both tradable and non-tradable activities, strengthen the transmission from productivity to real incomes, and progressively narrow the regional cost-of-living gap.

An important implication of our results is that the Italian labor market cannot be interpreted as a single integrated national market. Rather, it appears to operate as a dual system, composed of two regional blocks—North and South—separated by persistent differentials in shadow real exchange rates (SRERs), productivity, and real wages. These blocks are only weakly connected by labor mobility, despite the absence of formal institutional barriers and the presence of a common currency.

In principle, sustained differences in real wages and employment opportunities should induce significant interregional labor movements. In practice, however, labor mobility between the South and the North remains limited and highly selective, concentrated among younger and more educated cohorts. Housing costs, family networks, region-specific skills, public sector employment structures, and localized social capital all contribute to anchoring large segments of the workforce to their region of origin. As a result, regional labor markets remain partially segmented, even within a unified legal and monetary framework.

Within this segmented system, the SRER plays a role analogous to that of an internal real exchange rate, governing the terms of trade between regions. The North, characterized by higher productivity and higher prices, effectively "exports" high-value tradables and advanced services to the South, while the South "exports" labor-intensive goods, public services, and—indirectly—labor itself through selective migration. This configuration resembles an unequal internal trade partnership, in which relative prices, rather than quantities, perform most of the adjustment.

This perspective has important implications for how productivity should be interpreted. Standard productivity comparisons, whether measured as value added per worker or total factor productivity, implicitly assume that output prices reflect comparable purchasing power across regions. In the context of large and persistent price differentials, however, this assumption fails. A substantial share of observed productivity gaps reflects price components (output prices and wages) rather than pure differences in physical efficiency or technological capability. When prices and wages diverge systematically across regions, productivity measured in value terms may overstate real efficiency differences and understate the role of relative prices in shaping economic outcomes.

In other words, productivity gaps may be endogenous to the regional price system itself. Higher prices in the North inflate measured value added, while lower prices in the South compress it, even when underlying quantities: hours worked, effort, or physical output, are closer than nominal figures suggest. This mechanism reinforces regional disparities by making the South appear structurally less productive, thereby discouraging investment and innovation, while simultaneously justifying nationally uniform wages that are misaligned with local purchasing power.

Seen through this lens, the Italian North–South divide is not merely a story of technological lag or insufficient human capital. It is also a story of persistent internal real exchange rate misalignment, weak labor mobility, and institutional rigidities that prevent quantity adjustments and force most of the burden of adjustment onto prices and real wages. The resulting equilibrium is stable but inefficient: regional disparities persist, real wages diverge, and productivity comparisons become increasingly distorted.

This interpretation reinforces the central message of the paper. Policies aimed solely at raising productivity—without addressing price dynamics, wage-setting institutions, and barriers to labor mobility—risk delivering limited or misleading results. A credible convergence strategy must therefore act simultaneously on real exchange rate adjustment, sectoral productivity, and labor market integration, recognizing that these dimensions are inseparable components of a single internal economic system.

More broadly, our results underscore that convergence is not an automatic outcome of market forces alone. It requires policy coordination, institutional adaptation, and sustained investment. When these conditions are met, the Italian case suggests that long-standing regional disparities: much like those once separating Western and Eastern Europe—can be meaningfully reduced.

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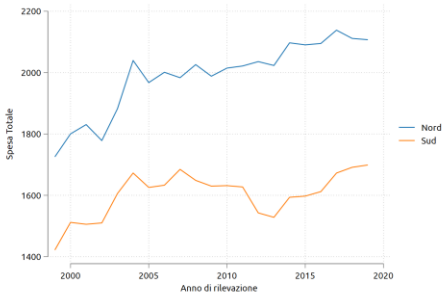
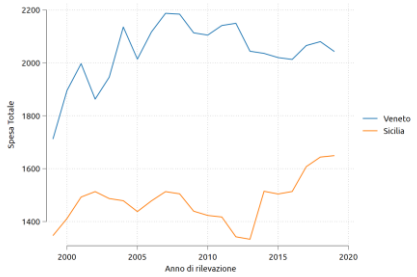
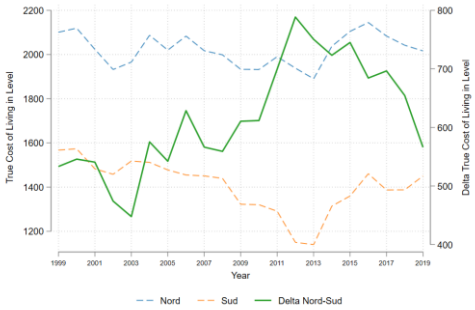
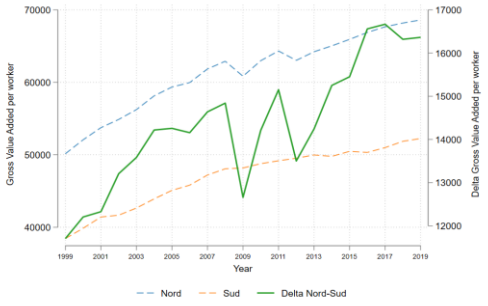
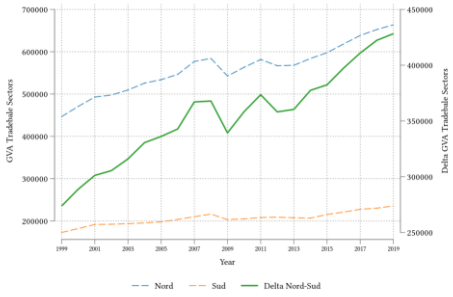
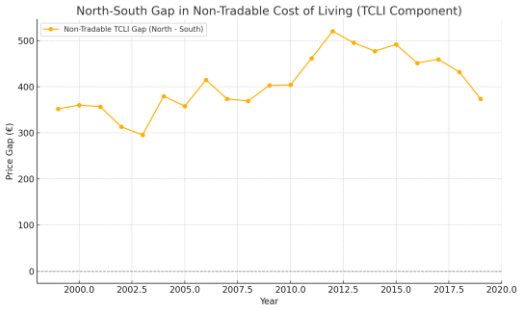
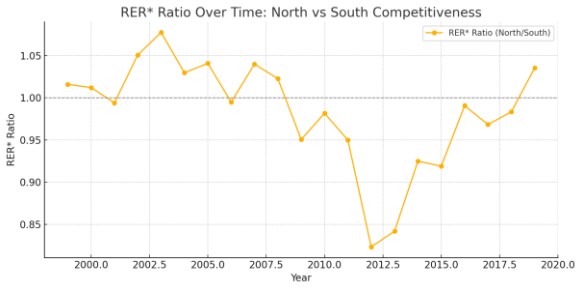
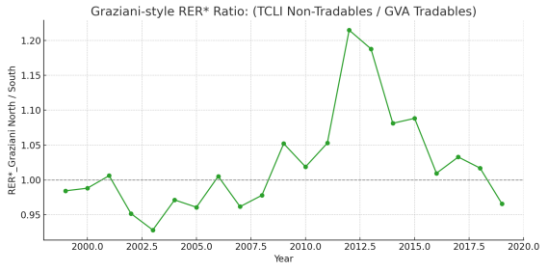
| Graph 1.1 Evolution of Cost of Livings (1999-2019)<br>Did the North – South Divide Remain the Same? | Graph 1.2 Regional Comparison: Veneto vs Sicily (1999-2019) |
|---|---|
|  |  |

| Graph 2.1 True Cost of Living (Real Levels) micro data | Graph 2.2 Gross Value Added per Worker |
|---|---|
|  |  |

| Graph 3.1 Gross Value Added in the Tradable Sector | Graph 3.2 North-South Gap in Non-tradable Cost-of-Living |
|---|---|
|  |  |

| Graph 4.1 RER* Ratio over time: North vs South Competitiveness | Graph 4.2 Graziani-style RER* Ratio: TCLI Tradables/GVA Tradables |
|---|---|
|  |  |



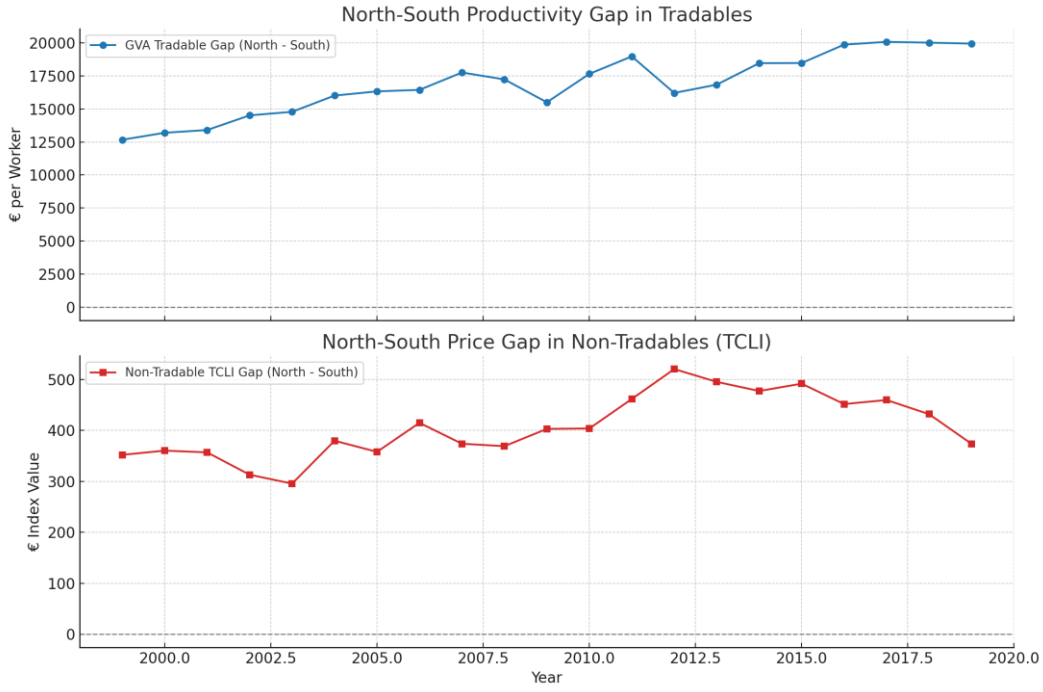
| Graph 5 North-South Productivity Gap in Tradables and Non Tradables |
|---|
|  |

Table 1. Granger Causality Test – Baseline VAR Model

| | **Coeff** | **Std. err.** | **z** |
|---|---|---|---|
| **Equation: Ln TCLI nord/sud** | | | |
| **Ln TCLI nord/sud** | | | |
| Lag1. | 0.869 | 0.272 | 3.190 |
| Lag2. | -0.364 | 0.273 | -1.330 |
| **Ln GVA/worker nord/sud** | | | |
| Lag1. | 0.840 | 0.798 | 1.050 |
| Lag2. | -1.518 | 0.782 | -1.940 |
| | | | |
| **Ln GVA Trade/Nontrade** | | 0.073 | |
| Lag1. | -0.144 | 0.073 | -1.990 |
| **Delta Spesa Pubblica Amm.** | | | |
| Lag1. | 0.000 | 0.000 | -0.750 |
| **Constant** | 0.534 | 0.362 | 1.480 |