# THE JOB THAT WILL BE BORN

*Generational cycle, URSS, and return on parental investment in Costa Rica, South Korea, and Italy*

*Original title (Portuguese): O emprego que nascerá: ciclo geracional, URSS e retorno do investimento parental em Costa Rica, Coreia do Sul e Itália*

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## ABSTRACT

We investigate whether societies whose N* index remains in the equilibrium zone can close a virtuous cycle among three generational cohorts (Descendants, Structurers, Ascendants). The premise is accounting-based, as each additional birth acts as a new consumer that raises final demand. Preliminary input-output calculations indicate that this demand sustains roughly 0.19 to 0.31 gross jobs per additional child per year, averaging around 0.25 across the three countries. A couple with 2.0 children thus generates about 0.5 jobs from children's demand alone, and considering the parents' longer presence in the Structurers cohort, the full cycle approaches 1.5 jobs. The study covers Italy and South Korea (2024 N* of 0.61 and 0.48, collapse zone) alongside Costa Rica (1.32, equilibrium zone). With fertility converging to 2.1 in 25 years, the 2099 N* reaches 1.01 in Italy, 0.90 in South Korea, and 0.88 in Costa Rica. The cost of children falls mainly on parents, and Costa Rican literature identifies critical gaps: national accounts do not measure the time devoted to unpaid production, which is part of the real cost of caring for others (Jiménez-Fontana, 2015), and the care regime remains socially unequal (Filgueira and Martínez Franzoni, 2019). Without tangible returns to the investing Sustainable Social Reproduction Units (URSS, from the Portuguese acronym), the three-link cycle weakens, making N* equilibrium an insufficient condition on its own.

**Keywords:** National Transfer Accounts; N*; generational cycle; URSS; fertility; employment; unpaid production; return on investment; intergenerational sustainability.

## 1. INTRODUCTION

Countries with very low fertility, such as Italy and South Korea, and countries that have reached this level more recently, such as Costa Rica, face a common dilemma through different trajectories: what happens to domestic demand, employment, and labor income when fewer children are born, and what changes if fertility approaches the level that sustains N* equilibrium?

The traditional approach is usually strictly demographic, focused on the dependency ratio and population aging. Here, the question is analyzed from the standpoint of consumption and the economic cycle. From the earliest years, every child born demands food, care, education, health care, and housing, which set domestic activity and jobs in motion. According to the data gathered in this study, this demand generates between 0.19 and 0.31 gross jobs per additional child per year. A couple with two children supports about half a job from children's consumption alone. Adding the parents' prolonged stay in the Structurers cohort, the full cycle linked to that couple approaches 1.5 jobs over time, closing a circuit that secures the employability of the next generation.

The study draws on generational economics (National Transfer Accounts, NTA). On this basis, we use the Narayama Systemic Index (N*) to establish each country's starting position and the Sustainable Social Reproduction Unit (URSS) as an observable category independent of labor-market status. Because the URSS is the agent that makes the investment, the central thesis holds that the three-link cycle (Descendants, Structurers, and Ascendants) is more stable when N* remains in the equilibrium zone and part of the return generated flows back to those who invested.

N*_Obs is defined as the square root of (Pop_Base ÷ Pop_Top) × (Births ÷ Deaths) × F, where F = TFR(t) ÷ TFR(t−25). Because it depends directly on fertility and age structure, its projection under different TFR scenarios is a demographic identity, not empirical proof. The conclusions of this study therefore rest on indicators external to the N* formula, such as the number of jobs, value added, labor income, and support and caregiver ratios.

The working hypothesis is that countries kept outside the equilibrium zone for long periods suffer a shrinking Structurers cohort, compressing both domestic demand and the capacity to support Ascendants. Although productivity gains and greater longevity may mask this erosion temporarily, the three-link circuit operates sustainably only when there is enough demographic replacement to stabilize N* and when the URSS's effort meets an economic counterpart. Without this return, the financial burden concentrates on the Structurers, reducing the attractiveness of the role and weakening the whole system.

**Central question.** Under what conditions can maintaining N* in the equilibrium zone, combined with recognition of the URSS's investment, allow the consumption generated by additional births to become employment, labor income, and material well-being for all three cohorts over time?

The axis of the investigation ("The Job That Will Be Born") unfolds along three fronts: measuring how much employment the demand of one additional child supports; identifying when and how that income returns to the Structurers who financed the process; and assessing how the initial position in N* conditions the closing of this cycle.

# 2. THEORETICAL AND CONCEPTUAL FRAMEWORK

## 2.1 Generational Economics and National Transfer Accounts

NTA estimate, by age group, consumption, labor income, saving, and public and private transfer flows. This methodology makes the economic life cycle explicit: children and older people consume more than they produce, and adults finance the difference (Lee and Mason, 2011; United Nations, 2013). In this study, we use NTA to link births to consumption by cohort and, through input-output tables, to connect that consumption to domestic production and job creation.

### 2.2 The Care Gap and Unpaid Production

The Latin American NTA literature already documents what is omitted from this monetary accounting. Rosero-Bixby (2011) applies NTA to five countries in the region (Brazil, Chile, Costa Rica, Mexico, and Uruguay) to examine the effects of population aging. Using the NTA methodology, Jiménez-Fontana (2015) shows that national accounts do not measure the time devoted to unpaid production, which receives no explicit compensation and represents part of the real cost of caring for others; the opportunity cost of this time depends heavily on educational attainment. Filgueira and Martínez Franzoni (2019) show that the combination of high income inequality and the absence of universal care services produces a socially unequal regime in which the work and cost of social reproduction are concentrated in particular groups and families. For South Korea, Hwang and Yoo (2025) use administrative data from the national health insurance system and estimate that women's earnings fall by more than 41% after the first child, with no recovery within five years; the drop is driven mainly by exit from employment (44% lower employment in the fifth year), and the loss one year after childbirth rose from 40% (cohorts born in 1976–80) to 46% (1981–85). This is a discussion paper, not peer-reviewed, and it measures the individual cost of motherhood rather than the cost recorded by NTA. This article uses monetary accounts and therefore does not measure care time.

### 2.3 N*, Cohorts, and the URSS

The model divides the population into three cohorts: Descendants (from birth to the first age cutoff), Structurers (between the two cutoffs), and Ascendants (from the second cutoff onward). The URSS, classified as Active, Fulfilled, or Inactive, is an observable unit independent of occupational status. On the provisional N* scale, the equilibrium zone lies between 0.90 and 1.40, the Accelerated Tension band runs from 0.71 to 0.90, and values below 0.71 constitute the collapse zone.

## 3. HYPOTHESES

**H1 (Consumption).** Each additional child raises Descendants' CFCc according to the age profile of consumption, serving as the model's basic premise.

**H2 (Jobs).** Higher consumption supports gross jobs, while net employment varies with idle capacity and the displacement of spending, factors that modulate the size of the result without negating the initial demand impulse.

**H3 (Labor income).** Aggregate labor income of Structurers under the Target scenario overtakes the Trend trajectory only after the new cohorts enter the labor market, tracing a J-curve whose trough reflects the cost borne by parents while raising their children.

**H4 (Saving).** The long-run behavior of saving remains indeterminate.

**H5 (Support ratio).** Ceteris paribus, the economic support ratio is higher under the Target scenario in the long run.

**H6 (Caregivers).** The potential supply of caregivers responds directly to changes in fertility, whereas demand (the population aged 80 or older) barely changes across the projected scenarios through 2099.

**H8 (Average condition).** With TFR stabilized around 2.1, the age structure stops its continuous deterioration, although it may settle at a level worse than in 2024. The hypothesis is stratified by each country's initial demographic position.

# 4. DATA AND METHODS

## 4.1 Sample

**Table 1 - Sample of countries and the role of each in the study**

| Country | N* 2024 | Zone | Role in the study |
|---|---|---|---|
| Italy | 0.61 | Collapse | Complete cohort accounts |
| South Korea | 0.48 | Collapse | Stress scenario |
| Costa Rica | 1.32 | Equilibrium Point | Contrast with its own NTA and unpaid-production data |

Source: AINU.Systems (2024 N*_Obs; demographic engine with UN population data, WPP 2024).

**Note on N* values.** The 2024 N* values used in this article (Italy 0.61, South Korea 0.48, and Costa Rica 1.32) are N*_Obs, calculated without the four adjustments in the falsifiability protocol (migration, inertia, policies, and underreporting). The independent thesis in which the index was proposed lists lower values for Italy (0.49) and South Korea (0.37), because it applies these adjustments (NGII_Puro) and, in South Korea's case, used the C80/D20 profile composition that preceded the one adopted here.

## 4.2 Age Cutoffs

The same delimitation was adopted for the three countries: Descendants aged 0 to 22; Structurers aged 23 to 60; and Ascendants aged 61 or older, following the C/D profile composition defined by the author. The cutoffs for each profile (Descendants from age 0 to the first value; Ascendants from the second value onward) are: A, 16 and 44; B, 18 and 55; C, 21 and 60; D, 23 and 62; E, 25 and 65.

## 4.3 Demographic Model

A cohort model was used, fed by the medium variant of the UN projections (WPP 2024). The Trend scenario keeps the TFR projected by the UN, whereas the Target scenario assumes linear convergence of TFR to 2.1 over 25 years, remaining stable thereafter.

## 4.4 From Consumption to Employment

The transmission chain follows the sequence: additional birth → ↑ CFCc → imported content (CIEc) + domestic value added (VADc) → gross jobs (EDPc) → net jobs (after deducting displacement and supply constraints). The reported employment figures represent potential demand ceilings, assuming zero displacement.

# 5. DEMOGRAPHIC RESULTS (EXPLORATORY)

## 5.1 N* Trajectory

**Table 2 - N* trajectory: 2024 and 2099 under the Trend and Target scenarios**

| Country | N* 2024 | N* 2099 Trend | N* 2099 Target | Interpretation |
|---|---|---|---|---|
| Costa Rica | 1.32 | 0.38 | 0.88 | Leaves equilibrium; settles in Accelerated Tension |
| Italy | 0.61 | 0.46 | 1.01 | Enters the equilibrium zone |
| South Korea | 0.48 | 0.29 | 0.90 | Reaches the edge of the equilibrium threshold |

Source: AINU.Systems (demographic engine, UN WPP 2024, medium variant). Scenarios as in Section 4.3.

Although the Target scenario avoids a deepening of demographic collapse, the results indicate that the recomposition of N* requires decades of transition and is not automatically guaranteed by the replacement rate alone.

## 5.2 Ascendants-to-Structurers Ratio

**Table 3 - Ascendants-to-Structurers ratio (A/E): 2024 and 2099 under the Target**

| Country | A/E 2024 | A/E 2099 Target | Change vs 2024 |
|---|---|---|---|
| Costa Rica | 0.31 | 0.78 | +0.48 |
| Italy | 0.61 | 0.72 | +0.11 |
| South Korea | 0.46 | 0.75 | +0.29 |

Source: AINU.Systems (demographic engine, UN WPP 2024, medium variant). Scenarios as in Section 4.3.

Note that the Target manages to slow the pace of relative aging but fails to return the countries to the age proportions recorded in 2024.

## 5.3 Potential Caregivers

**Table 4 - Potential caregivers: Structurers per person aged 80 or older (E/80+)**

| Country | E/80+ 2024 | E/80+ 2099 Target | Relative decline |
|---|---|---|---|
| Costa Rica | 20.6 | 2.8 | -86% |
| Italy | 6.4 | 3.1 | -51% |
| South Korea | 11.9 | 2.7 | -78% |

Source: AINU.Systems (demographic engine, UN WPP 2024, medium variant). Scenarios as in Section 4.3.

Even under the Target scenario, the decline in the availability of potential caregivers is structural, and the Target can only soften the magnitude of the loss.

## 5.4 Costa Rica: Why Replacement Does Not Return N* to Equilibrium

In the Target simulation, Costa Rica's N* falls to 0.80 in 2074 and settles at 0.88 by the end of the century. This behavior occurs because the country gradually loses its young age structure and the bonus from the F factor as its largest cohorts age. To keep N* permanently above 0.90, Costa Rica would require a TFR between 2.2 and 2.35 or significant immigration flows of young adults.

# 6. PRELIMINARY ECONOMIC RESULTS

## 6.1 Value Added and Employment per Unit of Consumption (ICIO 2019)

**Table 5 - Value added and employment per unit of final consumption (ICIO 2019)**

| Indicator | Costa Rica | Italy | South Korea |
|---|---|---|---|
| VADc per US$ of final consumption | 0.716 | 0.725 | 0.724 |
| Employment per US$ million of final consumption | 25.7 | 9.3 | 15.1 |

Source: OECD (ICIO 2019) and ILO (ILOSTAT), using the method in Section 4.4.

## 6.2 Gross Jobs per Additional Child

**Table 6 - Gross jobs per additional child per year, without and with displacement**

| Country | Gross jobs per child/year | With 50% displacement |
|---|---|---|
| Italy | 0.186–0.251 | 0.093–0.133 |
| South Korea | 0.314 | 0.157 |
| Costa Rica | 0.184–0.202 | 0.101 |

Source: OECD (ICIO 2019), ILO (ILOSTAT), and NTA (average consumption of one Descendant), using the method in Section 4.4.

On average across the three cases, the impact is on the order of 0.25 jobs per child per year (the simple average of the values is 0.23), so a couple with two children supports about 0.5 jobs per year from children's demand alone (Miller and Blair, 2009). The parents' phase in the Structurers cohort (38 years) is longer than the children's phase as Descendants (23 years), and for simplicity it is treated as roughly twice as long, giving $0.5 \times 2 = 1.0$. Adding the two phases, the full cycle approaches 1.5 job-years (between 1.3 and 1.5 if the exact ratio of 1.65 is used), not 1.5 simultaneous jobs.

Approximately one and a half jobs per couple is compatible with the usual division of care, in which mothers devote more time to children (Budig and England, 2001; Folbre, 2008), but it is sufficient only if the URSS receives part of the return on its investment, since children's demand creates jobs across the economy as a whole. The logic has support in the literature: demand as a determinant of employment (Keynes, 1937; Hansen, 1939), the private cost and collective benefit of raising children (Folbre, 1994; Sinn, 2004), NTA (Lee and Mason, 2011), dependence between generations (Samuelson, 1958; Caldwell, 1976), and unpaid care (Rosero-Bixby, 2011; Jiménez-Fontana, 2015; Filgueira and Martínez Franzoni, 2019). This is a demand channel, not a guaranteed net effect, since employment also depends on labor supply (Acemoglu and Restrepo, 2017). The calculation is the author's accounting illustration, not an estimated result.

## 6.3 Structurers' Labor Income (J-Curve)

Aggregate income under the Target overtakes the Trend only from 2055–2056 onward, ending 2099 between 54% and 104% above it, although still below the 2024 level. When the cost of raising children (life-cycle deficit) is deducted, the curve traces a trough of −5% to −21% and overtakes the Trend again only between 2067 and 2081.

### 6.4 Who Pays: The Case of Costa Rica

According to the 2013 NTA, 61.4% of Descendants' consumption in Costa Rica was covered by private transfers, requiring Structurers to give up a significant share of their surplus. In practice, while the cost of formation falls privately on families, the later economic benefits are appropriated collectively.

Time devoted to unpaid production is not measured by national accounts and is part of the real cost of caring for others (Jiménez-Fontana, 2015), meaning that families' actual effort is greater than the monetary record in NTA. This interpretation is consistent with Filgueira and Martínez Franzoni (2019), who showed the unequal distribution of this care burden. These findings come from the cited literature and were not re-estimated in this article, which does not quantify unpaid production.

## 7. DISCUSSION

The comparative results reveal three distinct outcomes under the Target scenario: only Italy reaches the equilibrium zone (1.01), South Korea touches the lower threshold (0.90), and Costa Rica leaves the equilibrium range, falling to 0.88.

In none of the countries analyzed does fertility convergence restore the 2024 demographic indicators. In addition, the financial cost of the transition falls directly on parents, producing a trough in the J-curve that persists for more than four decades, a period in which the private return measured by NTA remains nil or diffused across the collective.

The Costa Rican experience illustrates this mechanism clearly. The combination of 61.4% private financing of children's consumption, unpaid care time that monetary accounts do not capture, and an asymmetric care regime reinforces the central hypothesis: without mechanisms of recognition and return for the URSS, the generational cycle breaks precisely at the link that sustains the initial investment.

**URSS circularity (hypothesis).** Children's demand activates production chains and, with a lag, forms the future base of workers and taxpayers, but the return is distributed among third parties and the public sector and does not reach the investing unit in individualized form (Section 6.4). If recognition and compensation mechanisms returned part of this value to the URSS, they could reduce the private concentration of costs and encourage the next round of generational investment. This is an institutional hypothesis, not a finding: Costa Rica's data show the asymmetry, not the effect of any mechanism on fertility, net employment, or well-being. Recognizing the distinct and complementary contributions of families, without presuming who provides them, is the normative principle (contributory parity) guiding this agenda; its design and modeling are left for a separate article.

Thus, the creation of potential jobs does not occur through demographic automatism but depends on the institutional closing of this circuit and on the redistribution of costs now concentrated in families.

## 8. LIMITATIONS AND SAFEGUARDS

Some methodological constraints should be kept in mind when reading these results:

- N* operates as a structural demographic identity and does not by itself constitute causal evidence.
- The sample is restricted to three countries selected after the initial exploratory phase.
- The calculated employment volumes represent potential demand ceilings under zero displacement.
- The exclusion of unpaid production and care time from the monetary accounts means that the recorded private burden is understated.
- The cost gradient by number of children works as a reference parameter, not as a survey of actual spending.
- NTA accounts map the structure of generational costs but do not explain the subjective motivations behind fertility decisions.
- NTA profiles are averages by age and do not separate those who have children from those who do not; for South Korea, Hwang and Yoo (2025) suggest that mothers' earnings losses and selection into motherhood have changed across cohorts, so the J-curve estimated here is an average profile, not the causal effect of having children.

## 9. FINAL CONSIDERATIONS

This study began with a simple accounting observation: each additional birth introduces a new consumer into the economy, supporting between 0.2 and 0.3 gross jobs per child per year. In family terms, a couple with two children generates about half a job from children's consumption alone and roughly 1.5 jobs over the whole period in which the parents remain Structurers. This contingent represents the potential employment that will be born if the economic circuit manages to close.

The demographic simulations point to divergent paths even under a recovery of fertility, with Italy reaching N* equilibrium, South Korea touching its boundary, and Costa Rica losing its initial position, without any of them recovering the 2024 age ratios.

Three central conclusions emerge from the joint analysis:

- Restoring N* equilibrium requires a horizon of several decades.
- The replacement fertility rate is a basic requirement but does not by itself guarantee system stability.
- The cost of the demographic transition falls mainly on parents, weakening the three-link cycle whenever the URSS receive no return.

Costa Rica's case summarizes this impasse by showing that, in addition to the private financing recorded by NTA, unpaid work and inequality in care increase the real cost borne by families. Stabilizing demographic indicators is therefore not enough: future jobs will materialize sustainably only if investment in educating new generations ceases to be treated as an almost exclusively private burden.

## AUTHORSHIP AND AI USE STATEMENT

The ideas, the structure of the paper, the writing style, the theoretical foundation, the Narayama Systemic Index (N*), the formulas, the sample definition, and the interpretation of results are the author's work. Artificial intelligence tools were used for translation, image generation, and

language editing, under the author's review. The calculations are based on the sources listed under "Data Sources"; the demographic engine and N*_Obs data are available in the public AINU.Systems repository (https://github.com/itibere-muarrek/Ainu-Narayama, version v0.1.0; code under the MIT License and derived data under CC BY 4.0).

## ACRONYMS AND ABBREVIATIONS

CFCc, Cohort Final Consumption; ICIO, Inter-Country Input-Output, OECD international input-output tables; NTA, National Transfer Accounts; UN, United Nations; TFR, total fertility rate; URSS, Sustainable Social Reproduction Unit (original Portuguese acronym); WPP, World Population Prospects.

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## Data Sources

The numerical values in the text come from these sources or from the AINU.Systems engine, which uses UN population data. Access dates are those of the downloaded files.

**United Nations, Department of Economic and Social Affairs, Population Division (2024).** *World Population Prospects 2024*, medium variant: population by single year of age and total fertility rate. https://population.un.org/wpp/. Use: demographic engine, N*, cohort ratios, and Trend and Target scenarios (Sections 4.3, 5, and 6.3).

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**AINU.Systems.** Cohort projection engine, profile composition (C30/D70 for Italy and South Korea; C50/D50 for Costa Rica), and Directory (the project's country fact-sheet and simulation database). https://ainu.systems and https://narayama.live, accessed November 11, 2026. Use: N*_Obs, Trend and Target trajectories, A/E and E/80+ ratios (Sections 4 to 6).

Note. National fertility rates (INEC, ISTAT, KOSTAT) were not consulted directly in the official sources; fertility values come from the UN (WPP 2024). The calculations of employment per child, Structurers' labor income, and the cost of children follow the methods described in Sections 4 to 6, based on the files above; the routines for these calculations are not published in this version.