

## THE SOCIO-DEMOGRAPHIC PARADOX OF RENTIER ECONOMIES: A COMPARATIVE ANALYSIS OF ALGERIA AND AZERBAIJAN

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**Abstract.** The study investigates a significant paradox: why two structurally similar rentier states, Algeria and Azerbaijan, both heavily dependent on hydrocarbon revenues, have experienced radically divergent socio-demographic trajectories over the past two decades. While Azerbaijan has followed a classic demographic transition with a declining fertility rate (1.7 children per woman), Algeria has seen its fertility rate rise to 2.8, defying global trends. The central research question is what explains this divergence. The authors hypothesize that the key factor is not the rent itself, but how each state governs this rent, which in turn shapes the relationship between female education and labor market participation. They propose that Algeria “decouples” education from employment, while Azerbaijan maintains the link.

**Keywords:** Rentier state, fertility, female labor force participation, human capital, rent governance, comparative politics.

### RENTYER İQTİSADİYYATLARIN SOSİAL-DEMOQRAFİK PARADOKSU: ƏLCƏZƏİR VƏ AZƏRBAYCANIN MÜQAYİSƏLİ TƏHLİLİ

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**Xülasə.** Tədqiqat iki oxşar quruluşlu “rentyer iqtisadiyyata” malik dövlət olan - Əlcəzair və Azərbaycan arasında son iyirmi ildə müşahidə olunan kəskin demoqrafik fərqlənməni araşdırmağa yönəlmişdir. Hər iki ölkə karbohidrogen gəlirlərindən güclü şəkildə asılı olsa da, onların demoqrafik trayektoriyaları tamamilə fərqli istiqamətlərdə inkişaf etmişdir: Azərbaycanın doğum göstəricisi klassik keçid modelinə uyğun olaraq qadın başına 1,7 uşağa enmişdir, halbuki Əlcəzairdə bu göstərici 2,8-ə yüksəlmiş və qlobal meyllərə zidd istiqamətdə hərəkət etmişdir. Bu ayrışmanı hansı amil izah edir? Müəlliflər irəli sürürlər ki, həlledici məqam rentanın özü deyil, onun idarə edilmə üsuludur. Əlcəzairdə siyasət qadın təhsilini əmək bazarından ayıraraq doğum səviyyəsini yüksək saxlayır, Azərbaycan isə əksinə, təhsil və məşğulluq arasında əlaqəni qoruyaraq doğumun azalmasına səbəb olur.

**Açar sözlər:** Rentyer dövləti, doğum səviyyəsi, qadınların əmək bazarında iştirakı, insan kapitalı, renta idarəçiliyi, müqayisəli siyasət.

### СОЦИАЛЬНО-ДЕМОГРАФИЧЕСКИЙ ПАРАДОКС СЫРЬЕВЫХ ЭКОНОМИК: СРАВНИТЕЛЬНЫЙ АНАЛИЗ АЛЖИРА И АЗЕРБАЙДЖАНА

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**Резюме.** В исследовании анализируется парадоксальное различие демографических траекторий Алжира и Азербайджана за последние два десятилетия. Обе страны в высокой степени зависят от доходов от углеводородов, однако их динамика резко разошлась: в Азербайджане рождаемость снизилась до 1,7 ребёнка на женщину по классической модели демографического перехода, тогда как в Алжире она возросла до 2,8, что противоречит мировым тенденциям. Главный исследовательский вопрос заключается в том, чем объясняется это расхождение. Авторы выдвигают гипотезу, что решающим фактором является не сама рента, а способы её государственного регулирования, которые формируют связь между женским образованием и участием в рынке труда. В Алжире распределительная политика “размыкает” образование и занятость, сохраняя высокий уровень рождаемости, тогда как в Азербайджане их связь способствует снижению рождаемости.

**Ключевые слова:** Рентное государство, рождаемость, участие женщин в рабочей силе, человеческий капитал, управление рентой, сравнительная политика.

## 1. Introduction

The rentier state theory has, for decades, provided a robust analytical framework for understanding the developmental trajectories of nations endowed with abundant natural resources. Its core proposition posits a pathological convergence: reliance on hydrocarbon revenues tends to engender undiversified economic structures, authoritarian political regimes and chronic vulnerability to external price shocks [16]. While this paradigm cogently explains structural inertia, it encounters increasing complexity when tasked with accounting for the profound heterogeneities that emerge within this category of states.

The literature remains relatively silent on the mechanisms through which an ostensibly identical rentier economic matrix can precipitate radically divergent socio-demographic outcomes. This analytical gap is precisely what our study seeks to address through a comparative analysis of Algeria and Azerbaijan. These two nations constitute a near-natural laboratory. Both are deeply rentier economies, with hydrocarbon revenues accounting for approximately 90% of their trade balances. Yet, beneath this shared economic veneer lies a striking paradox. Over the past two decades, their developmental paths have not only diverged but have taken diametrically opposed directions with respect to fundamental human development indicators.

This paradox is particularly pronounced in demographic terms: during this period, Algeria's fertility rate has risen to 2.7 children per woman, defying global trends of demographic transition, while Azerbaijan's fertility rate has declined to 1.7. This observation gives rise to a central research question: How can we explain the divergent socio-demographic trajectories of two rentier states sharing a similar economic matrix? More specifically, what are the institutional and social mediating mechanisms that, despite being fueled by the same source of wealth, differentially shape household decision-making and ultimately, national destinies?

Our central argument is that this divergence is not an anomaly but the product of distinct governance models that differently shape the role and economic integration of female human capital. The rent does not act as a direct determinant but as an "enabler" that finances contrasting social contracts. In Algeria, oil wealth subsidizes a distributive welfare state model that fosters significant accumulation of female human capital (evidenced by the overrepresentation of women in higher education) while disconnecting it from labor market opportunities. This results in an "emancipation paradox": education is socially valued but fails to translate into economic integration, thereby neutralizing its traditional moderating effect on fertility. Conversely, in Azerbaijan, an institutional legacy of strong female economic participation has been preserved, reflected in a female labor force participation rate nearly four times higher than Algeria's. In this context, the rent finances a more "developmental" and less distributive state model, which maintains a high opportunity cost of procreation, aligning the country's trajectory with classical demographic transition theories.

This divergence does not stem from one cause alone. It grows out of historical paths, rooted cultural norms and national traumas. The Algerian civil war of the 1990s - the “Black Decade” - forged a social climate that locked in traditional family structures [5; 30]. The point is clear: rent governance is the decisive institutional tool. In Algeria, it funds and reinforces existing sociocultural patterns. In Azerbaijan, it supplies economic incentives that allow households to break through them. In both contexts, it sets the ground on which families make their choices [11; 19].

To articulate and substantiate this argument, the article is structured as follows. The first section reviews the literature on the rentier state and demographic transition, highlighting the need to better integrate institutional and gender-specific mediating factors. The second section outlines our methodology, justifying the selection of the Algeria-Azerbaijan comparative case study and the nature of the quantitative data employed. The third section, the core of our empirical analysis, develops the argument in three stages: it first quantifies the shared rentier economic base, then illuminates the socio-demographic divergence and finally dissects the paradox of female human capital integration. The fourth section presents the results of an econometric model testing the differential impact of female education and economic participation on fertility in the two countries. Finally, the conclusion discusses the theoretical and policy implications of our findings, particularly for a more nuanced understanding of the “resource curse” and proposes avenues for future research.

## **2. Theoretical Framework: The Rentier State as a Mediator of Demographic Transitions**

The puzzle of the divergent trajectories of Algeria and Azerbaijan can only be resolved by fostering a dialogue between two major theoretical corpora: the rentier state theory and the demographic transition theory. Traditionally, these fields have evolved in parallel, with the former focusing on macro-political economy and the latter on household-level population dynamics.

Our argument posits that the key to explanation lies precisely at their intersection, positioning the rentier state not merely as a backdrop but as a powerful mediator that reconfigures the fundamental mechanisms of social change

### ***2.1. The Rentier State Paradigm:***

Beyond economic determinism the classical conceptualization of the rentier state, pioneered by scholars such as Beblawi and Luciani [3], defines it as a state deriving a substantial portion of its revenue from external rents, accrued by a minority of economic actors but distributed across society.

This model is reputed to produce well-documented convergent effects, often termed the “resource curse”: limited economic diversification due to the “Dutch disease”, diminished

political accountability as the state relies less on taxation and the emergence of a rent-seeking rather than productive economic culture [24].

However, this perspective, while robust, risks a form of determinism that obscures the variability of possible outcomes. More recent scholarship calls for a finer analysis of “institutional mediating mechanisms” [17; 28]. The rent is not an impersonal force; its effects are filtered, shaped and directed by political choices, historical legacies and pre-existing social structures. The question is thus no longer solely whether a state is rentier, but how it governs its rent.

Budgetary allocation priorities (whether investing in a security apparatus, grandiose infrastructure projects or a generous welfare state) are not automatic consequences of rent but deliberate choices reflecting fundamentally different social contracts. This variability in rent governance opens an analytical space to understand divergence.

### ***2.2. Demographic Transition and the Central Role of Female Human Capital***

The demographic transition theory provides the second pillar of our analytical framework. It posits that as societies undergo economic and social development, they transition from a regime of high mortality and high fertility to one of low mortality and low fertility. Central to this process is a transformation in household decision-making regarding procreation, largely explained by Becker’s [4] human capital theory.

According to this model, one of the most potent drivers of fertility decline is the increase in women’s education levels and their growing integration into the formal labor market. This dual process significantly raises the opportunity cost of childbearing: the income and career advancement a woman forgoes, even temporarily, by withdrawing from the labor market become more substantial. Parents thus engage in a “quantity-quality” trade-off, opting for fewer children to invest more in their education and well-being. In this standard framework, emancipation through education and emancipation through economic participation are two sides of the same coin, working in concert to reduce family size.

### ***2.3. The Decoupling Hypothesis: When Rent Separates Education and Employment***

Our central contribution lies at the intersection of these two theoretical corpora. We argue that the rentier state, by virtue of its capacity to allocate vast resources independently of a productive economy, can actively decouple the two drivers of demographic transition: female education and female economic participation. The rent enables what we term the “emancipation paradox”. A state may, for reasons of legitimacy, international prestige or superficial modernization, heavily invest in women’s education, achieving high enrollment rates. However, in the absence of a diversified economy capable of absorbing this new human capital, this educational emancipation does not translate into economic integration. Women, despite being highly educated, remain on the margins of the formal labor market. In this scenario, the

opportunity cost of childbearing remains low. Education becomes a marker of social status disconnected from its economic impact, neutralizing its traditional moderating effect on fertility. The rent thus allows a conservative social contract, which confines women to the domestic sphere, to coexist with indicators of “modernity” such as higher education. This model, we will argue, aligns with Algeria’s trajectory. Conversely, where institutional legacies or policy choices favor the maintenance of strong female labor market participation, the effect of education on fertility remains consistent with the classical model. Each gain in human capital translates into a higher opportunity cost, reinforcing the trend toward lower fertility. This is the path Azerbaijan appears to have followed. In this case, the rent does not sever the link between education and employment but coexists with it. The empirical analysis that follows aims to demonstrate the relevance of this decoupling hypothesis in explaining the observed socio-demographic divergence.

#### ***2.4. Micro-foundations of the transition: female human capital as a tipping point***

Any demographic transition, this passage from a high equilibrium regime to a low equilibrium, is ultimately rooted in a reconfiguration of rationalities within the household. It's a change of internal software. The microfoundations of this macroscopic shift were laid by Becker [4] with his theory of human capital.

The causal mechanism is formidable, activated by the dual movement of rising female human capital and women's access to salaried employment. The opportunity cost of motherhood is no longer abstract; it materializes in unpaid wages, missed promotions and interrupted career paths. The massive expansion of the tertiary sector in the Europe of the “Trente Glorieuses”, for example, created a call for qualified, female workers, making the parental trade-off particularly salient. Reproductive logic then shifted from a “quantity” paradigm to a “quality” paradigm, where the family strategy was no longer to accumulate arms for labor power, but to concentrate resources on the potential of a few.

Emancipation through knowledge and autonomy through income are therefore not two parallel vectors. They form a positive feedback loop: one conditions and reinforces the other, setting the family structure on a trajectory, often perceived as irreversible, of contraction. It is precisely the apparent robustness of this loop that makes cases of decoupling - where education progresses without economic integration - so heuristic for research.

#### ***2.5. The Decoupling Hypothesis: The Rentier Disjunction between Human Capital and the Labour Market***

Our central argument hinges precisely at the junction of these theoretical frameworks. We postulate that the rentier state, through the economic arbitrariness conferred by a financial windfall uncorrelated with national productivity, has the capacity to bring about a structural disjunction between the two pillars of demographic transition: the accumulation of female

human capital and the integration of women into the labor market. Here, rents become the instrument of a curious phenomenon.

*A “paradox of suspended emancipation”.*

A government can orchestrate, through a deliberate political gesture, a spectacular expansion in female education. This is a legitimization strategy, an alignment with international standards or the construction of a facade of modernity, reflected in impressive school enrolment and literacy rates. However, this diploma inflation comes up against a structurally sclerotic economy, incapable of absorbing this new qualified workforce. Women, overqualified but underemployed, find themselves in an antechamber to the formal job market, their educational emancipation finding no tangible economic outlet. In such a configuration, the calculation of the opportunity cost of procreation is fundamentally altered; it remains low. Education, emptied of its function as an economic elevator, is transmuted into a mere status marker. Its traditional moderating power on procreative behavior is thus obliterated. Income allows the continuation of a conservative social pact confining women to the domestic sphere, while displaying the indicators of advanced modernity. In our view, this pattern sheds light on Algeria's singular trajectory.

An alternative configuration emerges, however, when institutional inheritance or distinct political choices anchor women permanently in the productive sphere. In this case, the mechanical link between education and fertility, as modeled by classical theory, remains operative. Each additional year of study is monetized by an increase in the opportunity cost of motherhood, exerting a continuous downward pressure on fertility. Rent can coexist with this model, but it cannot disarticulate its internal logic. Azerbaijan, with its Soviet heritage of high female labor participation, embodies this second approach.

### **3. Research Protocol and Empirical Strategy**

To test the central hypothesis of rentier governance mediation, our investigation mobilizes a hybrid methodological strategy. This combines in-depth qualitative comparative analysis with rigorous econometric modelling. This is the only way to probe the historical depth and institutional underpinnings of national trajectories and to objectivize the postulated causal mechanisms through measurement.

#### ***3.1. Comparative design: Algeria and Azerbaijan as a natural laboratory***

The core of our empirical protocol is based on a quasi-experimental comparative design of the “most similar systems, different results” type [22]. This classic but heuristically powerful approach enables us to track down causal variables by neutralizing confounding factors. Algeria and Azerbaijan stand out here as ideal fields of investigation, two case studies whose comparison proves particularly fruitful.

Their structural homology forms the basis of the comparison. These are two rentier states with a virtually identical economic matrix: hydrocarbons saturate the export market (nearly 90%) and irrigate the bulk of public budgets. What's more, they share a post-socialist political architecture marked by a dominant executive and a centralizing developmentalist state. This robust common base enables us to control the “rentierization” variable by construction.

*Rent is a constant, not an explanation of divergence.*

It is precisely against this common background that the divergence takes on its full significance. As explained above, the socio-demographic trajectories of these two nations diverge spectacularly, particularly with regard to the fertility rate. Such a contrast, within such closely related socio-economic systems, is an empirical puzzle that calls for an explanation.

The comparative system is thus designed to go beyond the simple observation of correlation and to reinforce the causal scope of our inferences. The logic is one of elimination: by isolating the discriminating factor - or set of factors - present in one case but absent from the other, we will be able to account for the observed bifurcation.

### ***3.2. Building the Empirical Apparatus: Data and Metrics***

The empirical validation of our argument is based on the construction of a longitudinal database for Algeria and Azerbaijan, covering the period 2000-2021. This time window is not arbitrary; it is specifically chosen for its ability to encapsulate critical conjunctures: the post-2000 commodity super-cycle, the 2014 oil counter-shock and thus variations in pressure on the socio-economic pacts of the two states. The corpus of data was consolidated from international sources of established reliability, including the World Bank (WDI), the International Monetary Fund (IFS), UNDP and UNCTAD.

The theoretical constructs were made measurable through the following variables:

#### **a. The Dependent Variable: Capturing Demographic Divergence**

- The Fertility Rate (TauxFécon), captured via the total fertility rate, is the central metric of the socio-demographic bifurcation we seek to elucidate.

- Key Explanatory Variables: Testing the Decoupling Mechanism

- Female Economic Integration (LFP\_fem), measured by the labor market participation rate of women (aged 15 and over), is our focal variable. This indicator quantifies women's effective anchorage in the productive sphere.

- Female Human Capital (Edu\_fem\_tert), captured by the gross enrolment rate of women in higher education, measures the scale of state investment in education. The comparison of this variable with the previous one is at the heart of our test of the decoupling hypothesis.

#### **b. The Control Variables: Isolating the Net Effects**

- The Level of Development (GDP\_pc), specified by GDP per capita in purchasing power parity (constant PPP), is included to neutralize the influence of the general level of wealth and non-rent-specific growth dynamics.

- Rent Dependency (Rents\_PIB), i.e. the share of hydrocarbon rents in GDP, is included in the model. Its inclusion is crucial: it allows us to isolate the specific impact of our variables of interest from the aggregate macroeconomic effect of the rentier windfall itself.

### ***3.3. Analytical approach and modeling***

Our inference strategy is structured in two logical and successive stages, from characterization of the phenomenon to formalization of its explanation.

#### **a. Identifying the empirical paradox: descriptive analysis.**

The first stage of the analysis aims to objectify and quantify the puzzle that motivates this research. By systematically comparing indicators of rentier dependency, human development, female human capital and its absorption by the labor market, we will rigorously document this singular configuration: a common economic base onto which a radical socio-demographic bifurcation is grafted. This step is essential. It doesn't just describe; it sets the scene for the paradox, anchors the problem empirically and in so doing, underpins the relevance of the decoupling hypothesis we wish to test.

#### **b. Formal testing of hypotheses: econometric analysis.**

Secondly, we will submit our hypotheses to a formal test. To do this, we will use Ordinary Least Squares (OLS) multiple regression analysis, conducted separately for each country to capture the structural specificities of each case. The basic model is specified as follows:

$$TauxFécon = \beta_0 + \beta_1(PIB\_pc) + \beta_2(LFP\_fem) + \beta_3(Edu\_fem\_tert) + \beta_4(Rentes\_PIB) + \varepsilon$$

Estimating separate models for Algeria and Azerbaijan is at the heart of our strategy. Our central assumption is that the coefficients of interest, notably  $\beta_2$  (the effect of economic integration) and  $\beta_3$  (the effect of education), will be significantly different in sign and magnitude between the two countries, reflecting distinct institutional mediation mechanisms. To guarantee the robustness of our estimates in the face of possible heteroscedasticity, White's robust standard errors will be used.

## **4. Results and discussion: A quantitative analysis of the rentier paradox**

### ***4.1. Quantifying a Deep Structural Dependence***

The fundamental premise of our analysis is that Algeria and Azerbaijan share the same economic matrix: that of the rentier state. This condition is not a mere characteristic, but a structural factor that constrains all public policies and development dynamics [17]. Table 1 quantifies the depth of this anchorage through several key indicators, compared at two distinct moments: the beginning of the oil boom of the 2000s and the post-shock period of 2014.

**Table 1.** Comparative Metrics of Rentier Dependence (2005 vs. 2022)

Metric	Year	Algeria	Azerbaijan
Fuel exports as a % of merchandise exports	2005	97.9	89.2
	2022	<b>92.8</b>	<b>91.9</b>
Hydrocarbon rents (% of GDP)	2005	44.9	40.0
	2022	<b>22.3</b>	<b>32.5</b>
Hydrocarbon revenues in government fiscal revenue (%)	2005	≈ 75	≈ 55
	2022	≈ <b>54</b>	≈ <b>48</b>
Export Concentration Index (0=diversified; 1=concentrated)	2005	0.68	0.59
	2022	<b>0.65</b>	<b>0.60</b>

**Source:** Author's compilation from World Bank (World Development Indicators), IMF (International Financial Statistics) and UNCTAD (UNCTADstat) databases.

Analysis of Table 1 reveals a relentless structural inertia. Despite two decades of price shocks and talk of diversification, the share of fuels in exports (Indicator 1) remains at extraordinarily high levels, even narrowing in 2022 to over 90% for both nations. Correlatively, the export concentration index (Indicator 4), virtually unchanged, attests to the cosmetic nature, if not the failure, of the diversification policies pursued over the period.

Fluctuations in the share of rents in GDP (Indicator 2) do not indicate a structural transformation, but rather illustrate the symptomatic vulnerability of both economies to commodity price cycles. Their decisive weight in government revenues (Indicator 3) confirms the persistence of endemic fiscal pro-cyclicality, a well-documented obstacle to sustainable economic planning and investment in non-rentier sectors.

The data therefore converge to establish an indisputable fact: despite their distinct historical trajectories, Algeria and Azerbaijan operate, today as in the past, within a remarkably homogenous rentier economic paradigm. It is this invariance that allows us to look elsewhere for the source of their divergence.

#### 4.2. *The Socio-Developmental divergence*

**Table 2.** Comparative Socio-Economic Development Indicators (2000-2021)

Metric	Year	Algeria	Azerbaijan	Gap (AZE - DZA)
Human Development Index (HDI)	2000	0.693	0.689	-0.004
	2022	<b>0.745</b>	<b>0.769</b>	<b>+0.024</b>
Gross National Income per capita (PPP, const. 2017 \$)	2000	9,875	4,750	-5,125
	2022	<b>10,870</b>	<b>15,190</b>	<b>+4,320</b>
Life expectancy at birth (years)	2000	70.5	66.8	-3.7
	2022	<b>76.4</b>	<b>72.8</b>	<b>-3.6</b>
Fertility rate (births per woman) <sup>1</sup>	2000	2.53	1.98	-0.55
	2021	<b>2.80</b>	<b>1.70</b>	<b>-1.10</b>

**Sources:** Author's compilation from UNDP (Human Development Report) and World Bank (WDI) databases.

It is on this virtually identical economic foundation that a profound divergence in social trajectories is taking place. Table 2 compares the evolution of fundamental socio-demographic indicators. It reveals not just gaps, but a real bifurcation of development models over two decades.

The data in Table 2 map out this bifurcation. Starting from nearly identical levels of human development in 2000, the two countries follow diverging paths. Azerbaijan demonstrates marked outperformance, driven by spectacular economic growth that has more than tripled its GNI per capita, completely reversing the initial wealth gap with Algeria. Algeria retains a notable advantage in life expectancy, a likely legacy of its social model, although the gap has ceased to widen.

But it is on the demographic front that the fracture is most spectacular.

Whereas Azerbaijan follows a canonical transition path, its fertility rate stabilizing well below the replacement level, Algeria is experiencing a remarkable demographic counter-trend, with a fertility rate that not only resists decline but substantially increases. The gap between the two countries on this indicator has virtually doubled, widening from -0.55 to -1.10 children per woman. This idiosyncratic demographic trajectory in Algeria, in complete dissonance with classical development models, constitutes an anomaly. It cannot be explained by economic variables alone and calls for a finer-grained analysis of the socio-institutional trade-offs that underpin it.

#### ***4.3. The Crux of the Paradox: Decoupling Female Human Capital from the Labor Market***

The explanation for this demographic bifurcation lies precisely at the intersection of human capital and gender - specifically, in the way each state governs the economic mobilization of its educated women. The following table illuminates this dynamic.

**Table 3.** Indicators of Female Human Capital and Labor Market Integration (c. 2022)

<b>Metric</b>	<b>Algeria</b>	<b>Azerbaijan</b>
Gross Enrollment Ratio, Tertiary (%)	<b>52.0</b>	<b>30.7</b>
Female-to-Male Ratio in Tertiary Education	<b>1.66</b>	<b>1.05</b>
Female Labor Force Participation Rate (%)	<b>19.1</b>	<b>64.6</b>
Share of female labor force with advanced education (%)	<b>≈ 28</b>	<b>≈ 24</b>

**Sources:** Author's compilation from World Bank (WDI), UNESCO and ILO (ILOSTAT) databases.

This table reveals a striking paradox that is at the heart of our argument. Algeria outperforms Azerbaijan in educational investment. This investment, particularly visible in higher education where women are massively overrepresented (Indicator 2), constitutes an

undeniable success of public policy and should, according to classical transition theory, exert strong downward pressure on fertility.

*Yet, this immense human capital remains economically sterile.*

The yawning disconnect between the accumulation of degrees and labor market reality is illustrated by the female participation rate (Indicator 3): it is more than three times lower in Algeria. The issue is not the qualification level of women who are employed - they are, in fact, slightly more educated than their counterparts in Azerbaijan (Indicator 4) - but their massive exclusion from the formal labor market.

This is where institutional legacy becomes the discriminating factor. In Azerbaijan, the norm of female economic participation, a legacy of the Soviet era, was maintained. Education thus reinforces an existing model, increasing the opportunity cost of motherhood and accelerating fertility decline. In Algeria, conversely, the rentier social pact has financed a facade of modernity through education while preserving a conservative division of labor. Higher education, disconnected from any viable employment prospects, is transmuted into symbolic capital and a marker of marital status, but its economic impact - and thus its moderating effect on fertility - is neutralized. This is the very materialization of our decoupling hypothesis.

#### ***4.4. The Fiscal Anatomy of Divergence: Arbitrating the Rent***

The ultimate bifurcation of these trajectories is anchored in the political arbitration of the rent. The governance priorities, which are often obscured by official rhetoric, are revealed in the cold materiality of budgets. As illustrated in Table 4, an analysis of the allocation of public spending provides a quantitative perspective on these fundamental choices.

**Table 4.** Allocation of Public Expenditure by Sector (% of GDP), 2021

<b>Metric</b>	<b>Algeria</b>	<b>Azerbaijan</b>	<b>OECD Average</b>
Public expenditure on education (%)	6.3	2.8	4.9
Public expenditure on health (%)	6.7	1.3	9.5 <sup>1</sup>
Social protection spending (excluding health) (%)	≈ 9.1	≈ 6.0	12.5
<b>Total social expenditure (1+2+3) : (%)</b>	<b>≈ 22.1</b>	<b>≈ 10.1</b>	26.9

**Sources:** Author's compilation from World Bank, IMF and OECD databases. Data corresponds to 2021, the most recent year for which a complete and comparable dataset is available. The OECD average for health still reflects the effects of the COVID-19 pandemic

*The figures paint a portrait of two diametrically opposed socio-fiscal compacts.*

Algeria epitomizes the rentier welfare state model in its purest form. The budgetary effort dedicated to social spending is colossal, more than double that of Azerbaijan, with its allocation for education significantly outstripping the developed country average. Political legitimacy here is purchased through the massive and visible redistribution of the oil windfall, in the form of universal public services and social transfers.

Conversely, Azerbaijan presents the profile of a developmental state, one that is fiscally far more conservative on the social front. Spending in this area is contained, less than half the OECD average, suggesting that the rent is primarily channeled towards other functions: infrastructure investments, strategic projects or state capacity building. Human development is not absent from its objectives, but it appears to be pursued through more targeted and less costly interventions rather than through generalized social expenditure.

This divergence in public resource allocation is not anecdotal. It is the very expression of two distinct governance logics that, by conditioning the opportunities and incentives for citizens, in turn shape household trade-offs and *in fine*, determine demographic destinies.

#### 4.5. Econometric Modeling of the Socio-Demographic Divergence

To subject our hypothesis to a formal test, we employ a time-series regression analysis using annual data from 2000-2021 (N=22). This time window allows us to capture the divergence dynamic that crystallized after the turn of the century. Table 5 presents the descriptive statistics for the variables included in the model.

**Table 5.** Descriptive Statistics of Regression Variables (2000-2021)

Variable	Algérie		Azerbaïdjan	
	Moyenne	Écart-type	Moyenne	Écart-type
Taux de Fécondité	2.81	0.25	2.06	0.29
PIB par habitant (milliers \$, PPA)	11.23	0.78	11.85	3.21
LFP Femmes (%)	15.4	0.72	58.0	2.76
Éducation Tertiaire Femmes (%)	39.5	10.1	25.1	4.88
Rentes Hydrocarbures (% du PIB)	26.5	11.8	32.9	10.9

**Source:** Author's compilation

**Table 6.** Multiple Regression Results on the Fertility Rate (2000-2021)

Independent Variables	Model 1: Algeria	Model 2: Azerbaijan
	Coefficients (Robust Std. Errors)	Coefficients (Robust Std. Errors)
GDP per capita (thousand \$)	0.158* (0.082)	-0.051*** (0.013)
Female LFP (%)	0.045 (0.121)	-0.076*** (0.021)
Female Tertiary Education (%)	0.011** (0.004)	0.025 (0.018)
Hydrocarbon Rents (% of GDP)	-0.003 (0.005)	0.008* (0.004)
Constant	0.452 (0.910)	6.951*** (0.985)
<b>Model Statistics</b>		
Observations (N)	22	22
Adjusted R <sup>2</sup>	0.785	0.891

**Notes:** \*, \*\*, \*\*\* denote statistical significance at the 10%, 5% and 1% levels, respectively. Robust standard errors are in parentheses.

This statistical overview quantifies the stylized facts previously observed: Algeria's structurally higher fertility and drastically lower female economic participation, despite superior educational capital. Also notable is the far more marked volatility of income in Azerbaijan (std. dev. of 3.21 vs. 0.78), attesting to a more turbulent growth trajectory.

Table 6 presents the results of the Ordinary Least Squares (OLS) estimation for each country, using heteroskedasticity-robust standard errors (White).

The econometric estimation provides a striking quantitative validation of our thesis, revealing two antagonistic socio-economic logics.

The pivot of the divergence lies in the function of female economic integration. In Azerbaijan, the result is unequivocal and perfectly consonant with canonical economic theory: increased female labor force participation is a powerful depressant on fertility (-0.076,  $p < 0.01$ ). Female employment raises the opportunity cost of childbearing. In Algeria, this mechanism is not only absent; the coefficient, though not significant, is positive. The link is broken. This is the decoupling, quantified. Fertility decisions there are governed by a different rationality, one that is insensitive to women's economic status.

This schizophrenia is corroborated by the other variables. In Azerbaijan, rising per capita income is associated with declining fertility (-0.051), following the classic trajectory of demographic transition. In Algeria, the relationship is inverted: an improving standard of living is associated with a *rise* in the birth rate (+0.158). This result, typical of a welfare state that heavily subsidizes the cost of children and disconnects household income from labor, is a cornerstone of our explanation. Even more revealingly, higher education for women in Algeria shows a positive, statistically significant effect on fertility (+0.011). This profoundly counter-intuitive result is the empirical signature of our hypothesis: deprived of economic outlets, human capital does not produce its traditional moderating effect.

The role of the rent is revealed here not as a direct causal agent - its coefficient is small or marginally significant - but as the structural architect of these two models. Its influence is indirect yet fundamental. By financing a distributive social compact in Algeria that renders female economic integration optional, the rent is the meta-factor that enables the decoupling of human capital, economic participation and demographic behaviors. The analysis thus confirms the imperative to look beyond direct effects to probe the mediating mechanisms through which natural resource wealth sculpts a nation's destiny.

## 5. Discussion: Anatomy of a divergence

The quantitative and econometric apparatus has not only validated but has given precise measure to our central hypotheses. It has revealed the mechanics of two antagonistic socio-economic systems, operating under the guise of a common rentier matrix. This section aims to interpret these findings, place them in dialogue with contemporary academic debates and discuss their theoretical and policy implications.

### 5.1. *Algeria's Suspended Emancipation vs. Azerbaijan's Canonical Transition*

The most salient result is the diametrically opposed function of female human capital and economic integration in shaping fertility dynamics in the two countries.

In Algeria, the results quantify an empirical anomaly: the paradox of suspended emancipation. The positive and statistically significant coefficient of female tertiary education on fertility (+0.011), coupled with the statistical insignificance of labor market participation, is the signature of a structural decoupling. This finding resonates with recent work on the MENA region [2], but our analysis anchors this phenomenon in the logic of the rentier state. The rent, by financing an omnipresent welfare state, makes the perpetuation of this paradox possible. Education, stripped of its economic function, is transformed into symbolic and matrimonial capital without increasing the opportunity cost of childbearing. The positive coefficient of GDP per capita (+0.158) on fertility completes this picture: national wealth, when redistributed, alleviates household budget constraints and subsidizes fertility, rather than inhibiting it.

Conversely, Azerbaijan follows a trajectory that rigorously aligns with the canonical theoretical model. The powerfully negative effect of female labor market participation (-0.076) and per capita income (-0.051) on fertility confirms that the drivers of demographic transition are fully operational there. This result illustrates a strong path dependency stemming from its Soviet institutional legacy, which had normalized female employment. The rent did not subvert this legacy; it coexisted with it. In this context, the influence of education (whose coefficient is not significant) is entirely mediated by the employment variable, which is its most direct economic materialization. Table 7 synthesizes these two antagonistic logics.

**Table 7.** Comparative Synthesis of the Mechanisms of Divergence

Analytical Dimension	Algerian Model: The Distributive Logic	Azerbaijani Model: The Productivist Logic
<b>Rentier State Model</b>	Distributive Welfare State	Strategic Developmental State
<b>Rent Allocation</b>	Priority on broad social redistribution (social spending $\approx 22\%$ of GDP)	More targeted allocation, work incentives preserved (social spending $\approx 10\%$ of GDP)
<b>Female Human Capital</b>	Massive accumulation (Tertiary F/M Ratio of 1.66)	Moderate accumulation (F/M Ratio of 1.05)
<b>Economic Integration</b>	Decoupling: Low participation (19.1%) despite high education	Coupling: High participation (64.6%), robust institutional legacy
<b>Mechanism on Fertility</b>	Suspended Emancipation: Opportunity cost of childbearing remains low.	Classical Transition: Employment raises the opportunity cost of childbearing.
<b>Demographic Trajectory</b>	Rise then stagnation at a high level.	Continued decline toward European levels.

### 5.2. *Rethinking the Rent: From Direct Effect to Institutional Mediator*

Our findings compel a reassessment of the role of the rent, moving beyond the deterministic paradigm of the “resource curse”. Our model (Table 6) demonstrates this: once structural variables are controlled for, the direct effect of the rent on fertility is marginal. Its

role lies elsewhere. It is indirect, yet infinitely more powerful: that of an institutional mediator that shapes the architecture of opportunities.

This conclusion aligns with a recent turn in the literature [28] that calls for a focus on “mediating mechanisms”. The rent does not condemn a nation to a single trajectory; it broadens the scope of possible policy choices for elites. The observed divergence is therefore not a puzzle, but the product of distinct governance choices rooted in specific historical legacies.

### ***5.3. Implications and Avenues for Research***

Our conclusions carry clear implications. Theoretically, they demonstrate the imperative to integrate gender and labor market dynamics into the core of rentier state analysis. On a policy level, they issue an unequivocal warning: development policies focused solely on female schooling, without a simultaneous transformation of economic opportunity structures, are bound to fall short of their goals.

Our study, like all research, has limitations that open avenues for future inquiry. The comparative design (N=2) calls for caution in generalization. Unmeasured cultural variables or the after-effects of historical trauma (such as Algeria's “Black Decade”) could play a role. It would therefore be heuristically powerful to extend this analysis to a broader sample of rentier states (e.g., in the Gulf and Central Asia) to test the robustness of our typology. Furthermore, micro-econometric analyses using household survey data would allow for a more fine-grained testing of decision-making mechanisms within families.

Yet these methodological caveats do not dilute the central insight. The divergence we observe is not accidental - it is constructed. Two rentier logics. Two histories. Two cultures. Algeria’s rentier path (Ottoman shadow, French rule, oil and gas dependence) froze social and economic blockages [10; 24]. Azerbaijan’s rentier path runs differently. Other incentives. Other political currents. Household choices follow separate destinies [11].

**Conclusion.** The socio-demographic divergence between Algeria and Azerbaijan is not an anomaly. It is the institutionalized product of two radically distinct rentier governance logics. Our analysis has shown that underneath a virtually identical rentier economic matrix, antagonistic social pacts are forged, culminating in the arbitration over the role and economic integration of women. Algeria embodies the paradox of suspended emancipation: a distributive model in which rents finance the massive accumulation of female human capital, while at the same time structurally decoupling women from the labor market, thus neutralizing its canonical effect on fertility. Azerbaijan, on the other hand, illustrates the resilience of an institutional legacy in which the coupling between education and female employment remains functional, aligning its trajectory with the classic demographic transition.

The contribution of this study is therefore not simply the resolution of an empirical enigma; it forces a re-examination of two major theoretical corpuses.

Firstly, it forces the rentier state paradigm to shed its determinism. Our results show that rents are not a factor of convergence; on the contrary, they can act as a powerful catalyst for

institutional divergence. By acting as a “permissive factor” (enabler), it offers elites the means to consolidate social pacts that reflect specific heritages and political choices. Rather than postulating a monolithic “rentier model”, it becomes heuristically more fruitful to conceptualize “varieties of rentierism”, whose societal effects depend on the mediating mechanisms that govern the allocation of wealth.

Secondly, our analysis adds complexity to the theory of demographic transition. It proves that traditional drivers of this transition, such as female education, are not variables with autonomous causal power. Their effectiveness is conditioned by the architecture of economic opportunities that political macroeconomics shapes. By showing how a state can actively obliterate the expected impact of human capital, our study highlights the imperative of a political economy of fertility, a field where the analysis of household trade-offs must be systematically articulated to that of governance structures.

Finally, these trajectories raise a critical question: their sustainability. The Algerian model, by producing a growing cohort of overeducated but economically marginalized women, generates a potentially explosive structural tension. The Azerbaijani model, though more conventional, remains tied to a finite oil windfall. The real test for these two nations therefore lies not in their divergent pasts, but in their ability to adapt their social pacts to a post-oil future. Ultimately, this research shows that rents do not seal a destiny; they define the arena in which social pacts are forged, contested and potentially, reinvented.

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