What Would Saudi Arabia Look Like Without Vision 2030?

Early Evidence from Synthetic Controls

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Abstract

This paper studies the main early effects of the Vision 2030 reforms on their target sectors, ten years after their announcement (April 2016 to April 2026), using the Synthetic Control Method to address the question: "What would Saudi Arabia look like without Vision 2030?". By constructing a credible counterfactual for Saudi Arabia from a donor pool of structurally comparable economies, we estimate the causal contribution of the reform across four sectors central to economic diversification: Female Labor Force Participation, Foreign Direct Investment, International Tourism, and Services Employment.

Our results provide early evidence of positive effects.Female labor force participation exceeded its counterfactual, reaching a gap of nearly 15 percentage points by 2023. FDI inflows surpassed the synthetic benchmark by 15 billion USD by 2023, with a cumulative treatment effect of 41 billion USD. Tourism arrivals exceeded the counterfactual by approximately 20 million visitors by 2024, with cumulative treatment effect of approximately 48 million additional arrivals over 2017–2024, while employment in services expanded by about 10 percentage points beyond its predicted trajectory.

Placebo tests and permutation inference confirm that these divergences are unlikely to reflect chance or common regional trends. Taken together, the findings suggest that Vision 2030 is associated with significant and measurable structural transformation across all four dimensions examined.

Keywords:
Vision 2030, Saudi Arabia, synthetic control method, economic diversification, foreign direct investment, tourism development, female labor force participation, services employment, structural transformation

JEL Classification:
C21, C33, O11, O53, Q33, J16

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Contents

Introduction

On April 25, 2016, Mohammed bin Salman announced Saudi Arabia's Vision 2030, a major reform program intended to move the Kingdom beyond strong dependence on oil revenues and toward a more diversified and sustainable economy in the long term. The strategy introduced economic and social reforms designed to invest in human capital, accelerate structural transformation, and support private sector development in preparation for a post-oil future. [1]

This paper is written in the context of ten years after the launch of Vision 2030. It applies the synthetic control method to evaluate the early measurable effects of the reform across four strategic objectives announced in the official Vision 2030 document [1]: increasing the women participation in the labor market; attracting foreign direct investment; enabling the development of the tourism sector; and increasing localization of non-oil sectors.

We can track the progress of these four objectives through the following proxies: female labor force participation rate, FDI net inflows, international tourist arrivals, and employment in services, the latter serving as a direct measure of non-oil sector development and structural transformation. In fact, one of Vision 2030's mais goals is to reduce unemployment and diversify the labor market away from oil dependency and public sectore. Employment in the services sector appears as a legitimate proxy to reflect both the development of non-oil sectors and labor market inclusion.

The synthetic control method, developed by Abadie and Gardeazabal [2] and extended by Abadie et al. [3], appears as a credible and legitimate tool to conduct our analysis and measure the impact of Vision 2030. However, to the best of our knowledge, no study has yet applied this method to assess the overall economic impact of Vision 2030 across multiple dimensions of diversification. The closest contribution in the literature is Frode Martin Nordvik [4], who applies the synthetic control method to estimate the causal effect of Saudi Arabia's gender law reforms on female labor force participation. This paper finds results consistent with our own (a comparison will be discussed in Section 3.2). While this work is directly related to one of the four outcomes we examine, its scope remains limited to the female labor market and does not extend to FDI, tourism, or structural transformation in the services sector.

This paper therefore addresses a gap in the literature by providing the first comprehensive synthetic control evaluation of Vision 2030 across four key dimensions of the reform program.

The synthetic control method constructs a counterfactual as a weighted average of control countries that were not subject to comparable reforms, at least across our four fields of interest. Their combination therefore provides a credible approximation of the trajectory Saudi Arabia would have followed in the absence of Vision 2030. This "Synthetic Saudi Arabia" is constructed using data spanning the period 2000–2016 or 2000-2017 (depending on the outcome variable) as the pre-treatment window, with post-treatment outcomes observed through 2023 (2024 for toursim).

The choice of the starting year deserves justification, and we argue that year 2000 is a good candidate for three reasons. First, as Abadie et al. [3] establishes, the length of the pre-treatment period T_0 is a key determinant of the bias in the estimated gap between Saudi Arabia and its synthetic counterpart. Formally, Abadie et al. [3] shows that: $E(|Y_{1t}^N - \hat{Y}_{1t}^N|) \leq Bound(\cdot, \underbrace{T_0}_{(-)})$ meaning that the bias depends negativly on T_0, making $T_0 \in \{15, 16\}$ years (2000–2015 or 2000–2016) a reasonable and well-supported choice. Second, data quality over this period is satisfactory across all four outcome variables and donor countries. Third, the year 2000 provides sufficient distance from the perturbations of the 1990s Gulf War period, reducing the risk that pre-treatment structural breaks contaminate the synthetic control fit.

To assess the robustness of our results, which will be discussed in detail in Section 3.2, we perform three complementary tests for each of the four outcome variables. The first is the **placebo-in-space test**, in which each donor country is reassigned the treatment as if it had implemented a comparable reform in 2016. This generates a distribution of placebo gaps against which Saudi Arabia's post-reform divergence can be benchmarked: if the Saudi gap is systematically larger than those of the placebo units, the observed effect is unlikely to be due to chance. The second test is the **Post/Pre RMSPE ratio test**, which compares the root mean squared prediction error in the post-treatment period to that in the pre-treatment period

for both Saudi Arabia and each placebo unit. A high ratio for Saudi Arabia relative to the donor pool indicates that the post-reform deviation is disproportionate relative to the pre-reform fit, lending credibility to a causal interpretation. The third test is a **treatment dummy t-statistic**, obtained by regressing the ratio of observed to synthetic outcomes on a post-treatment dummy for Saudi Arabia and for each placebo country separately. A large, positive, and statistically significant t-statistic for Saudi Arabia, combined with insignificant estimates for most placebo units, further supports the causal attribution of the observed divergence to Vision 2030.

The remainder of this paper is structured as follows. Section 1 presents a brief historical background of the Saudi economy since the Kingdom's unification, tracing the structural dependence on oil revenues that motivated the reform agenda. Section 2 situates Vision 2030 in its historical and economic context, explaining why deep structural reforms became a strategic necessity, a discussion that builds directly on Section 1. Section 3 constitutes the empirical core of the paper: it presents the synthetic control framework, constructs the four outcome models, and discusses the results in detail. Section 4 synthesizes the findings and presents early evidence of the success of Vision 2030 across the four dimensions examined. Section 5 concludes.

1 Historical Background

After its reunification in 1932 under King Abdulaziz Ibn Saud, Saudi Arabia remained a largely rural and resource-constrained economy with limited administrative capacity and infrastructure. The discovery of oil in commercial quantities in 1938 fundamentally transformed the country's development trajectory and established hydrocarbons as the central pillar of fiscal revenues and exports. By the early 1970s, oil revenues already represented the dominant share of government income and external receipts, shaping the structure of the Saudi state and its development strategy [5].

1.1 King Abdulaziz (1932–1953): State Formation and Oil Foundations

During the reign of King Abdulaziz, the primary objective was political consolidation and territorial stabilization following the unification of the kingdom. Economic policy remained limited in scope, but the concession agreement with Standard Oil of California in 1933 and the beginning of oil exports in 1938 laid the foundations of the modern Saudi rent-based economy [5]. Oil quickly became the main source of fiscal resources and allowed the emergence of the first centralized administrative institutions.

1.2 King Faisal (1964–1975): Oil Expansion and Development Planning

King Faisal's period marked the beginning of structured economic planning and rapid modernization. Rising oil revenues during the 1970s enabled the government to finance large-scale infrastructure investments, education expansion, and public-sector employment. National income increased rapidly during this period and the state assumed a central role in economic activity [6].

This phase of state-led modernization coincided with major geopolitical tensions in the Middle East, particularly the Arab–Israeli conflict of October 1973. In response to Western support for Israel during the war, several Arab oil-producing countries, including Saudi Arabia, implemented the 1973 oil embargo as an instrument to pressure Western governments to reconsider their political and military support.

The 1973 oil embargo represented a turning point in Saudi Arabia's global economic position, significantly increasing oil revenues and strengthening its geopolitical influence. These revenues financed the first generation of development plans and accelerated urbanization and social transformation.

1.3 King Fahd (1982–2005): Institutional Expansion and Welfare State Consolidation

Under King Fahd, Saudi Arabia consolidated its welfare-state model based on oil-financed redistribution. Public employment expanded significantly and infrastructure investments continued across transport, health,

and education sectors. During this period, the state strengthened its role as the primary employer of Saudi nationals.

However, declining oil prices in the 1980s exposed structural vulnerabilities in the development model and highlighted the risks associated with hydrocarbon dependence. Economic diversification policies began to receive increased attention, including the expansion of industrial cities such as Jubail and Yanbu[7].

Despite these initiatives, diversification outcomes remained limited and the hydrocarbon sector continued to dominate exports, fiscal revenues, and GDP composition.

1.4 King Abdullah (2005–2015): Gradual Reform and Human Capital Investment

During King Abdullah's reign, economic reforms focused on education, institutional modernization, and partial labor-market adjustments. Large investments were directed toward universities, research centers, and scholarship programs abroad to strengthen human capital development.

At the same time, Saudi Arabia launched major infrastructure and industrial projects intended to support private-sector growth. Nevertheless, the public sector remained the dominant employer and diversification progress remained moderate[8].

Rising demographic pressure and increasing unemployment among nationals highlighted the limitations of the existing development model and reinforced the need for deeper structural reforms.

1.5 King Salman (2015–) and the Launch of Vision 2030

Following the sharp decline in oil prices after 2014, Saudi Arabia faced growing fiscal pressure and increasing awareness of the need for structural transformation. Under King Salman, the government initiated a comprehensive reform strategy aimed at restoring fiscal sustainability and reducing dependence on hydrocarbons.

These challenges provided the immediate macroeconomic context for the launch of Vision 2030 in 2016.

1.6 Crown Prince Mohammed bin Salman: Vision 2030 and Structural Transformation

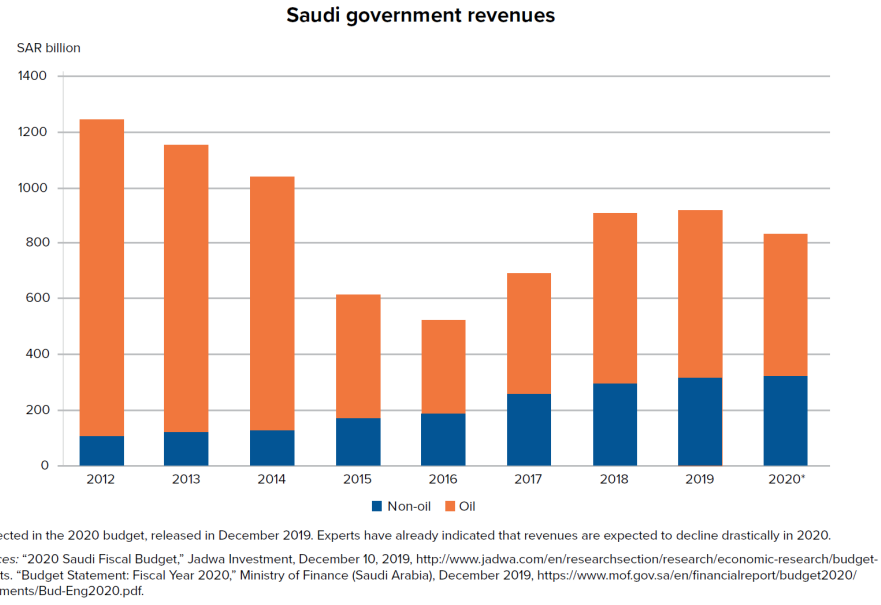
Vision 2030 represents the most ambitious reform program in Saudi Arabia's modern economic history. The strategy aims to strengthen private-sector participation, increase female labor-force participation, attract foreign direct investment, and diversify government revenues away from oil.

The reform program also includes fiscal consolidation measures, privatization initiatives, and large-scale investment projects coordinated through the Public Investment Fund. These policies reflect a shift from the traditional allocation-state model toward a more diversified growth strategy centered on productivity and private-sector expansion[9].

2 The Necessity of Reforms: Leadership and Strategic Vision

As Section 1 establishes, despite several attempts at reforming and diversifying the economy, non-oil sectors remained limited in their contribution. This is illustrated in Figure 1, adapted from Grand, S. and Wolff K.[9], which shows that oil revenues have consistently represented the overwhelming majority of Saudi government revenues.

Figure 1: Saudi Government Revenues: Oil and Non-Oil Decomposition



*Projected in the 2020 budget, released in December 2019. Experts have already indicated that revenues are expected to decline drastically in 2020.

Sources: "2020 Saudi Fiscal Budget," Jadwa Investment, December 10, 2019, http://www.jadwa.com/en/researchsection/research/economic-research/budget-reports. "Budget Statement: Fiscal Year 2020," Ministry of Finance (Saudi Arabia), December 2019, https://www.mof.gov.sa/en/financialreport/budget2020/Documents/Bud-Eng2020.pdf.

The structural change that preceded Vision 2030 was both economic and institutional. The fall in oil prices in 2014–2015 increased concerns within the Saudi leadership[9] that the existing economic model could not continue in the same way.

In March 2015, the Council of Ministers transferred the supervision of the Public Investment Fund (PIF), created in 1971, to the newly established Council of Economic and Development Affairs (CEDA), chaired by Crown Prince Mohammed bin Salman.

This institutional reform marked an important turning point. Under the new governance structure, Yasir Al-Rumayyan was appointed Governor of the PIF, a position he has held since 2015. During this period, the Fund started to change from a mainly domestic investment vehicle into a major sovereign wealth fund with an active international role. At the time of this transfer, the PIF managed around $150 billion in assets. Under Vision 2030, its target is to reach about $2 trillion by 2030[9].

The role given to the PIF became central to the reform strategy. It was expected to help generate new sources of wealth outside the oil sector through domestic and international investments. It also aimed to reduce the outflow of Saudi capital toward foreign consumption by supporting the development of competitive local sectors with strong economic multiplier effects.

Vision 2030 later formalized this strategy through the introduction of Vision Realization Programs (VRPs). These programs replaced a fragmented investment approach that depended heavily on oil revenues with a more coordinated framework based on accountability, sector diversification, and large-scale development projects intended to support long-term economic transformation.

2.1 Preparation of the Reform Plan

The preparation of Vision 2030 followed an intensive domestic planning process led by the Council of Economic and Development Affairs under the direction of Crown Prince Mohammed bin Salman[9]. Based on detailed economic diagnostics and sector-level studies, the reform strategy identified eight priority sectors

beyond hydrocarbons, including mining, manufacturing, tourism and hospitality, healthcare, and finance, as sectors with strong development potential for the Kingdom [1].

The reform framework focused on three main objectives: increasing workforce productivity, improving the business environment, and diversifying government revenues. This preparation phase also replaced the tenth five-year national development plan with a broader long-term strategy. It marked an important change in Saudi planning policy, moving from short-term planning cycles toward a longer-term transformation strategy.

2.2 Official Announcement of Vision 2030

On April 25, 2016, Crown Prince Mohammed bin Salman officially presented Vision 2030 as a national transformation strategy built around three main pillars: a vibrant society, a thriving economy, and an ambitious nation [1]. Each pillar included specific and measurable targets.

Under the economic pillar, the strategy aimed to increase the private sector's contribution to GDP from 40 to 65 percent, raise foreign direct investment from 3.8 to 5.7 percent of GDP, reduce the unemployment rate from 11.6 to 7 percent, and increase the share of non-oil exports in non-oil GDP from 16 to 50 percent [1].

The social pillar introduced targets related to female labor force participation, cultural activity, and quality of life. The governance pillar aimed to improve Saudi Arabia's position in the Government Effectiveness Index from 80th to 20th place worldwide. These objectives were implemented through 13 VRPs.

3 Ten Years Later: Measuring the Outcomes

After 10 years of the announcement (April 2016 – April 2026), sufficient time has passed to begin evaluating its early measurable effects. This section constitutes the empirical core of the paper. As discussed in the introduction, we apply the synthetic control method across four outcome variables central to the reform agenda: Female Labor Force Participation, Foreign Direct Investment, International Tourism, and Employment in Services.

The methodology follows the framework developed by Abadie [2 3 10 11] which provides a transparent and data-driven approach to causal inference in comparative case studies involving a single treated unit.

3.1 Econometric Framework

3.1.1 Synthetic Control Method

Let Y_{1t} denote the observed outcome for Saudi Arabia and Y_{jt} the outcome for donor country $j = 2, \ldots, J+1$. The synthetic counterfactual outcome in the absence of Vision 2030 is:

$$\widehat{Y}_{1t}^{N} = \sum_{j=2}^{J+1} w_j Y_{jt}, \qquad w_j \geq 0, \quad \sum_{j=2}^{J+1} w_j = 1$$

Following Abadie et al. [3], restricting weights to be non-negative and to sum to one prevents extrapolation outside the support of the data and ensures that the synthetic unit is a convex combination of observed countries.

The treatment effect after the reform announcement is:

$$\widehat{\tau}_{1t} = Y_{1t} - \widehat{Y}_{1t}^{N}$$

where $\widehat{Y}_{1t}^{N}$ represents the counterfactual path that Saudi Arabia would have followed in the absence of Vision 2030.

The optimal weight vector W^* is selected to minimise the distance between Saudi Arabia and the synthetic control in the pre-intervention period:

$$W^* = \arg\min_W (X_1 - X_0 W)' V (X_1 - X_0 W)$$

where X_1 and X_0 collect pre-treatment predictors and lagged outcome averages, and V is a positive semi-definite matrix assigning relative importance to each predictor. This data-driven selection of weights formalises the choice of comparison units and improves the credibility of the counterfactual trajectory [10].

Consistent with the institutional timeline of the reform programme, the intervention year is defined as: $t = 2016$ for Female Labour Force Participation Rate and Foreign Direct Investment, and $t = 2017$ for Tourism Arrivals and Employment in Services.

Treatment timing differs slightly across outcome variables depending on the nature of the reforms. For female labor force participation, the treatment period begins in 2016, following a sequence of reforms that directly affected women's access to the labor market, including the removal of mobility restrictions and changes in workplace regulations. These measures produced immediate improvements in women's ability to enter employment.

For foreign direct investment, the treatment period is set to 2016 to reflect the forward-looking nature of foreign investment decisions. Because international capital is highly mobile, investors react not only to implemented reforms but also to credible policy announcements and regulatory expectations. Early signals associated with Vision 2030 began already in late 2015 and early 2016, before the official launch of the program. Following Abadie [11], the treatment date therefore corresponds to the moment when expectations about the reform environment plausibly started influencing investor behavior rather than the later implementation stage.

In contrast, the effects on international tourism and employment in services require more time to appear. Tourism responds gradually to policy changes because international visitors need time to update their perceptions and travel decisions after reforms such as visa facilitation, sector opening, and large-scale tourism projects. Similarly, employment in services reflects slower structural adjustments linked to private sector expansion and sectoral diversification. For these reasons, the treatment year is set to 2017.

3.1.2 Synthetic Control Weights

SCM selects donor weights to reproduce Saudi Arabia's structural characteristics before Vision 2030 as closely as possible. Formally:

$$W^* = (w_2^*, \ldots, w_{J+1}^*)$$

such that:

$$X_1 \approx X_0 W^*$$

Countries receiving zero weight do not contribute to the counterfactual trajectory. Positive weights indicate similarity with Saudi Arabia in terms of pre-treatment predictors and outcome dynamics. This transparency is a key advantage of SCM relative to regression-based approaches because it allows direct evaluation of the credibility of the comparison unit [11].

3.1.3 Donor Pool

Following the recommendations of Abadie et al. [3], the donor pool is restricted to countries that were not exposed to a structural reform programme comparable in scale to Vision 2030 during the study period and whose macroeconomic trajectories are driven by similar structural determinants.

The baseline donor pool includes resource-dependent economies with comparable fiscal exposure to hydrocarbons and similar labour-market adjustment constraints:

Table 1: Donor pool used to construct Synthetic Saudi Arabia

Country	Region	Selection rationale
Bahrain	GCC	Oil-dependent fiscal structure and labour-market similarity
Kuwait	GCC	High hydrocarbon revenue dependence and limited structural reform
Oman	GCC	Comparable demographic pressures and fiscal adjustment path
Qatar	GCC	Resource-based economy without a Vision-2030-type reform shock
Malaysia	Southeast Asia	Resource exporter with gradual diversification trajectory
Algeria	MENA	Hydrocarbon-dependent state with persistent fiscal reliance on oil
Kazakhstan	Central Asia	Transition resource economy with comparable export structure

The United Arab Emirates is excluded because its diversification strategy predates Vision 2030 and therefore violates the SCM requirement that donor units should not be affected by comparable structural shocks during the study period [11]. Norway is excluded because its mature institutional framework and sovereign wealth governance model make it structurally distant from GCC labour-market dynamics.

For Model 4 (services employment), the donor pool is expanded. This specification requires a broader comparison group because employment in the services sector depends more strongly on education structure, institutional effectiveness, and labour force participation patterns than on hydrocarbon dependence alone. Expanding the donor pool improves the quality of the pre-treatment match when additional predictors are included, which is consistent with recommendations in the synthetic control literature to enlarge the donor set when necessary to obtain a satisfactory pre-intervention fit [3].

At the same time, Qatar is excluded from the donor pool for this specification. The organisation of the FIFA World Cup 2022 generated a large temporary expansion of the services sector, especially in construction, hospitality, transport, and related activities. This exceptional event created structural dynamics that are not comparable to the reform-driven transformation considered in this paper and would therefore distort the construction of a credible counterfactual trajectory for Saudi Arabia.

3.1.4 Outcome Models

Four synthetic control models are estimated.

Model 1: Female Labor Force Participation

Literature review In the Saudi case, increasing female labour force participation represents a central objective of Vision 2030 and has been directly supported through legal, educational, and labour-market reforms.

Income per capita is one of the strongest predictors of female labour supply across countries. During early industrialisation, participation often declines at first, but it increases later as education expands and the services sector grows. For Saudi Arabia, Agboola [12] show a clear positive relationship between income growth and female participation.

Demographic factors also matter. Lower fertility increases female labour supply because childcare constraints become less binding and women can devote more time to work. Using cross-country evidence, Boolm et al. [13] show a strong negative relationship between fertility and female labour force participation, especially among women aged 20–39.

Urbanisation also supports female employment by improving access to labour markets, education, and services. Urban areas typically provide more opportunities in services and public-sector activities, which are more compatible with female participation.

Education is another key determinant. Higher female education raises expected wages and improves access to skilled occupations. In the Saudi context, Agboola [12] show that the expansion of female education has played an important role in increasing labour market participation over the last decades.

Institutional reforms affecting mobility and legal status are particularly important in Saudi Arabia. After 2017, reforms that relaxed mobility restrictions and parts of the guardianship system were followed

by a rapid increase in female labour force participation. Using a synthetic control approach similar to the present study, Frode Martin Nordvik [4] estimate an increase of about nine percentage points within three years, which is consistent with the effects identified here.

Finally, resource dependence may also influence female labour supply through sectoral structure. Oil-driven growth tends to concentrate employment in capital-intensive industries and the public sector, which historically reduced incentives for female participation in private labour markets. Controlling for oil rents therefore helps capture structural constraints that are specific to hydrocarbon-based economies.

Final model Based on these theoretical and empirical considerations, female labour force participation is modelled as:

$$FLFPR_{jt} = \beta_1 lnGDPpc_{jt} + \beta_2 Fertility_{jt} + \beta_3 Urban_{jt} + \beta_4 FemaleEducation_{jt} + \beta_5 OilRents_{jt} + \varepsilon_{jt} \quad (1)$$

In addition to structural predictors, lagged averages of the outcome variable are included to reproduce pre-treatment labour market dynamics:

$$FLFPR_{00\text{–}05}, \quad FLFPR_{06\text{–}10}, \quad FLFPR_{11\text{–}15}$$

Following Abadie et al. [3], including lagged outcome values improves the ability of the synthetic control to reproduce unobserved determinants of the outcome trajectory prior to the intervention.

Model 2: Foreign Direct Investment

Literature review Foreign direct investment (FDI) is an important channel through which structural reforms support economic diversification, technology transfer, and productivity growth in developing and resource-dependent economies. Improving the investment climate is therefore one of the main objectives of Vision 2030.

Market size is one of the strongest predictors of FDI inflows. Higher income per capita signals stronger domestic demand and higher expected returns for foreign investors. Using evidence from developing economies, Abdi et al. [14] show that GDP per capita is a significant determinant of FDI inflows.

Trade openness also plays an important role because it facilitates integration into global value chains and reduces transaction costs for multinational firms. Countries that are more integrated into international trade tend to attract more foreign investment due to better export opportunities and easier access to intermediate inputs, as shown by Abdi et al. [14].

Institutional quality is another key determinant of investment attractiveness. Higher government effectiveness improves regulatory predictability, contract enforcement, and administrative efficiency, which reduces uncertainty for foreign investors. Abdi et al. [14] identify governance quality as a major determinant of FDI inflows, especially in developing and resource-rich economies.

Macroeconomic stability also influences investment decisions. Inflation is commonly used as an indicator of instability and policy uncertainty. Higher inflation increases risk and reduces expected returns, which discourages foreign capital inflows.

Natural resource dependence also affects the sectoral composition of FDI. Resource rents capture the importance of extractive industries and help control for resource-seeking investment behaviour that is common in hydrocarbon-exporting economies.

FDI is smoothed using a centred three-year moving average to reduce the influence of short-term fluctuations driven by global financial cycles and large investment projects.

Final model Based on these considerations, the empirical specification is:

$$FDI_{jt} = \beta_1 lnGDPpc_{jt} + \beta_2 TO_{jt} + \beta_3 GovEff_{jt} + \beta_4 Inflation_{jt} + \beta_5 ResourceRents_{jt} + \varepsilon_{jt} \quad (2)$$

Model 3: Tourism Development

Literature review Tourism development represents an important pillar of Saudi Arabia's diversification strategy under Vision 2030 and is one of the sectors most directly targeted by recent structural reforms.

Income per capita is a key determinant of tourism activity because it reflects both infrastructure quality and destination attractiveness. Higher income levels are usually associated with better transport networks, stronger hospitality services, and improved urban amenities that support tourism expansion.

Population size also matters because it captures domestic market scale and the capacity to sustain tourism-related services. Larger economies tend to develop stronger tourism ecosystems through links between infrastructure, services, and labour markets.

Institutional quality plays an important role in shaping tourism inflows by influencing security conditions, administrative efficiency, and international perceptions of the destination. Using cross-country evidence, Ghalia et al. [15] show that better governance quality and stronger political stability significantly increase tourism flows.

Tourism arrivals are included in logarithmic form. The log transformation helps reduce heteroskedasticity that is common in cross-country tourism data and limits the influence of extreme observations related to the COVID-19 shock.

Final model Tourism development is therefore modelled as:

$$lnTourism_{jt} = \beta_1 lnGDPpc_{jt} + \beta_2 lnPOP_{jt} + \beta_3 GovEff_{jt} + \varepsilon_{jt} \tag{3}$$

Model 4: Employment in Services

Literature review Government effectiveness affects service-sector employment through regulatory quality, coordination capacity, and improvements in the investment climate. Institutional quality plays an important role in supporting private-sector service expansion.

Secondary education captures the role of human-capital accumulation in supporting labour reallocation toward modern services. Structural transformation toward services typically requires higher skill levels than those associated with extractive-sector employment, as shown by Eichengreen and Gupta [17].

Inflation is included to control for macroeconomic instability that may affect labour demand in non-tradable sectors such as services.

Female labour force participation is also included because services are the main sector absorbing increases in female employment during structural transformation episodes. Using evidence from advanced economies, Rachel et al. [16] show that most of the long-run increase in female market hours is concentrated in service-sector activities.

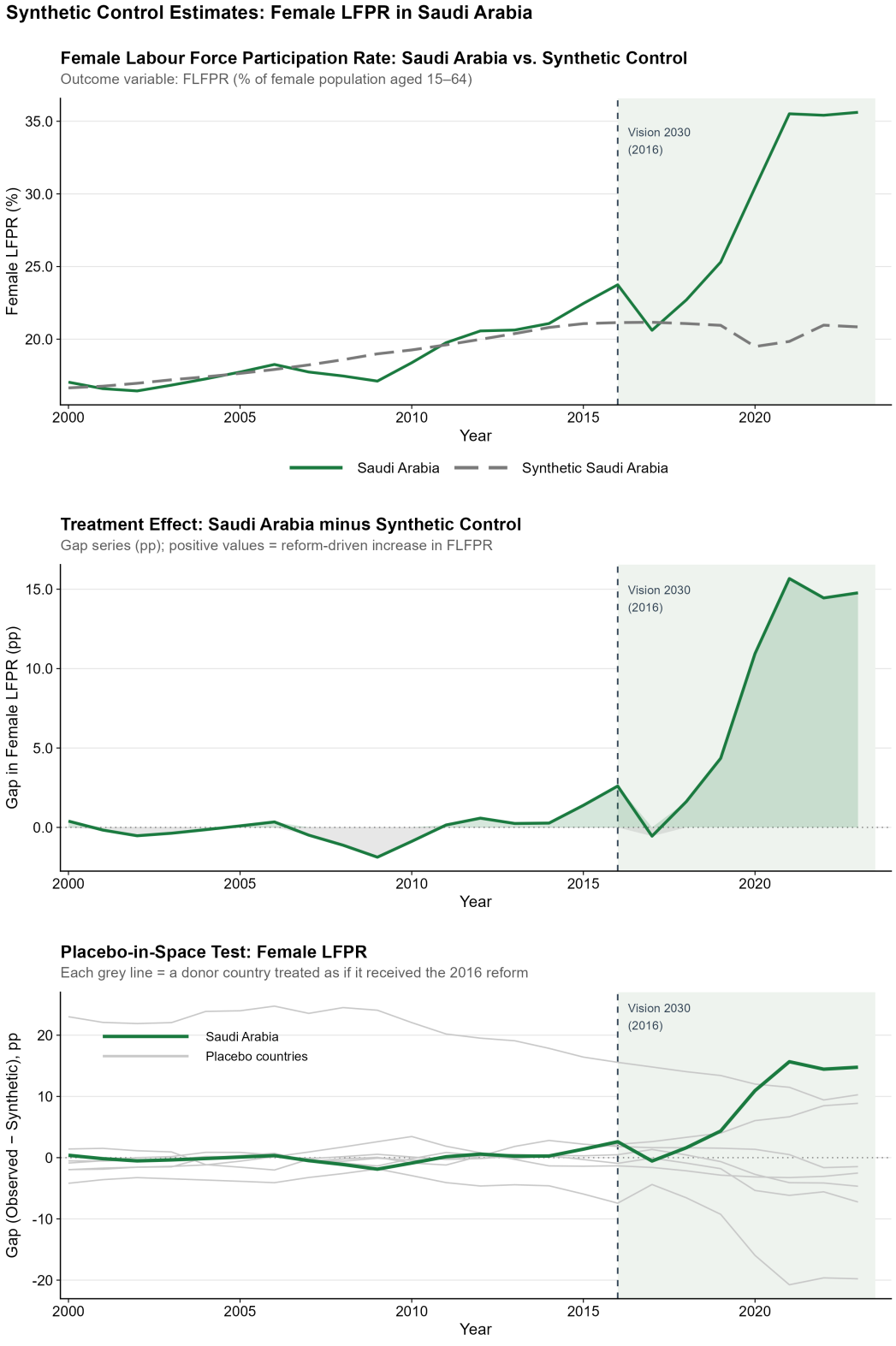
Final model Employment in services is therefore specified as:

$$EmploymentS_{jt} = \beta_1 GovEff_{jt} + \beta_2 SecondEduc_{jt} + \beta_3 Inflation_{jt} + \beta_4 LFPRF_{jt} + \beta_5 Services_{jt} + \varepsilon_{jt} \tag{4}$$

3.2 Results

3.2.1 Female Labor force participation rate

Figure 2: Results of Model 1



Source: Author's calculations based on World Bank Data

Figure 2 presents the synthetic control estimates for female labor force participation in Saudi Arabia. The upper panel compares Saudi Arabia and its synthetic counterpart over 2000–2023. The pre-treatment fit is close between 2000 and 2016, which supports the credibility of the counterfactual (see Table 7).

Predictor balance also confirms a good match before treatment (see Table 2). The synthetic control reproduces well the lagged FLFPR values in 2000, 2005, 2010, and 2015. Some differences remain for structural variables such as oil rents and urbanization, which reflects the difficulty of constructing a perfect match for Saudi Arabia with a small donor pool.

After 2016, the trajectories diverge clearly:

- The treatment effect becomes strongly positive from 2018 onward.
- It reaches about 10.94 pp in 2020 and peaks at 15.67 pp in 2021.
- The effect stabilizes around 14–15 pp in 2022–2023 (see Table 6).

This pattern reflects the gradual implementation of Vision 2030 labour-market reforms, including the lifting of the female driving ban in 2018, the relaxation of guardianship rules, and the introduction of anti-harassment legislation.

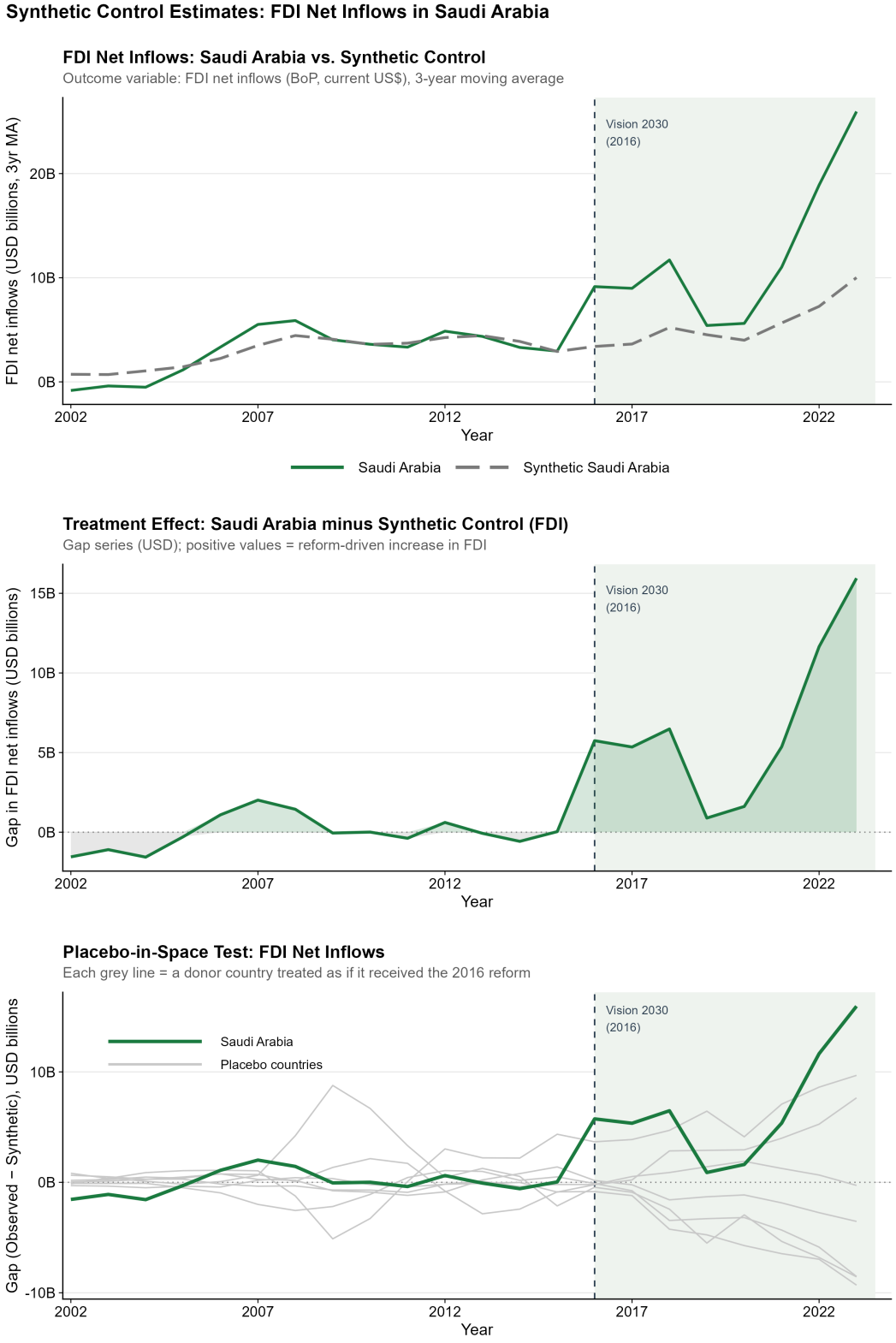
Robustness checks support these results:

- The Post/Pre RMSPE ratio is 13.53, which is the highest in the donor pool (see Table 4 and Figure 7).
- The treatment dummy t-statistic equals 4.9 ($p < 0.01$), confirming statistical significance (see Table 5).

The lower panel of Figure 2 presents placebo-in-space results showing that Saudi Arabia's post-reform gap is clearly larger than most placebo gaps. These findings are consistent with Frode Martin Nordvik [4], who reports a treatment effect of about nine percentage points over 2017–2021 using a similar synthetic control approach, supporting the credibility of the estimates.

3.2.2 Foreign Direct Investment

Figure 3: Results of Model 2



Source: Author's calculations based on World Bank Data

Figure 3 presents the synthetic control estimates for FDI net inflows in Saudi Arabia. The upper panel compares Saudi Arabia and its synthetic counterpart over 2002–2023. The pre-treatment fit is reasonably close before 2016, supporting the credibility of the counterfactual trajectory.

Predictor balance also confirms that the synthetic control reproduces relatively well the main pre-treatment characteristics of Saudi Arabia (see Table 8). The match is not perfect, which is expected given the volatility of FDI flows across resource-dependent economies, but the overall pre-treatment trajectory is captured satisfactorily.

After 2016, the trajectories diverge clearly:

- The treatment effect becomes positive immediately after 2016.
- The gap increases strongly in the following years.
- A temporary decline appears in 2019–2020, consistent with global investment shocks during the COVID period.
- From 2021 onward, the gap increases rapidly and reaches its highest level by 2023 (see Table 12).

Setting the treatment year to 2016 reflects the forward-looking nature of foreign investment decisions. Because international capital is highly mobile, investors react not only to implemented reforms but also to credible policy announcements and regulatory expectations. Early signals associated with Vision 2030 began already in late 2015 and early 2016, before the official launch of the program. Following Abadie [11], the treatment date therefore corresponds to the moment when expectations about the reform environment plausibly started influencing investor behavior rather than the later implementation stage.

This pattern is consistent with the progressive implementation of investment-related reforms under Vision 2030, including regulatory improvements, sectoral liberalisation, and policies aimed at increasing foreign investor participation.

Robustness checks support these results:

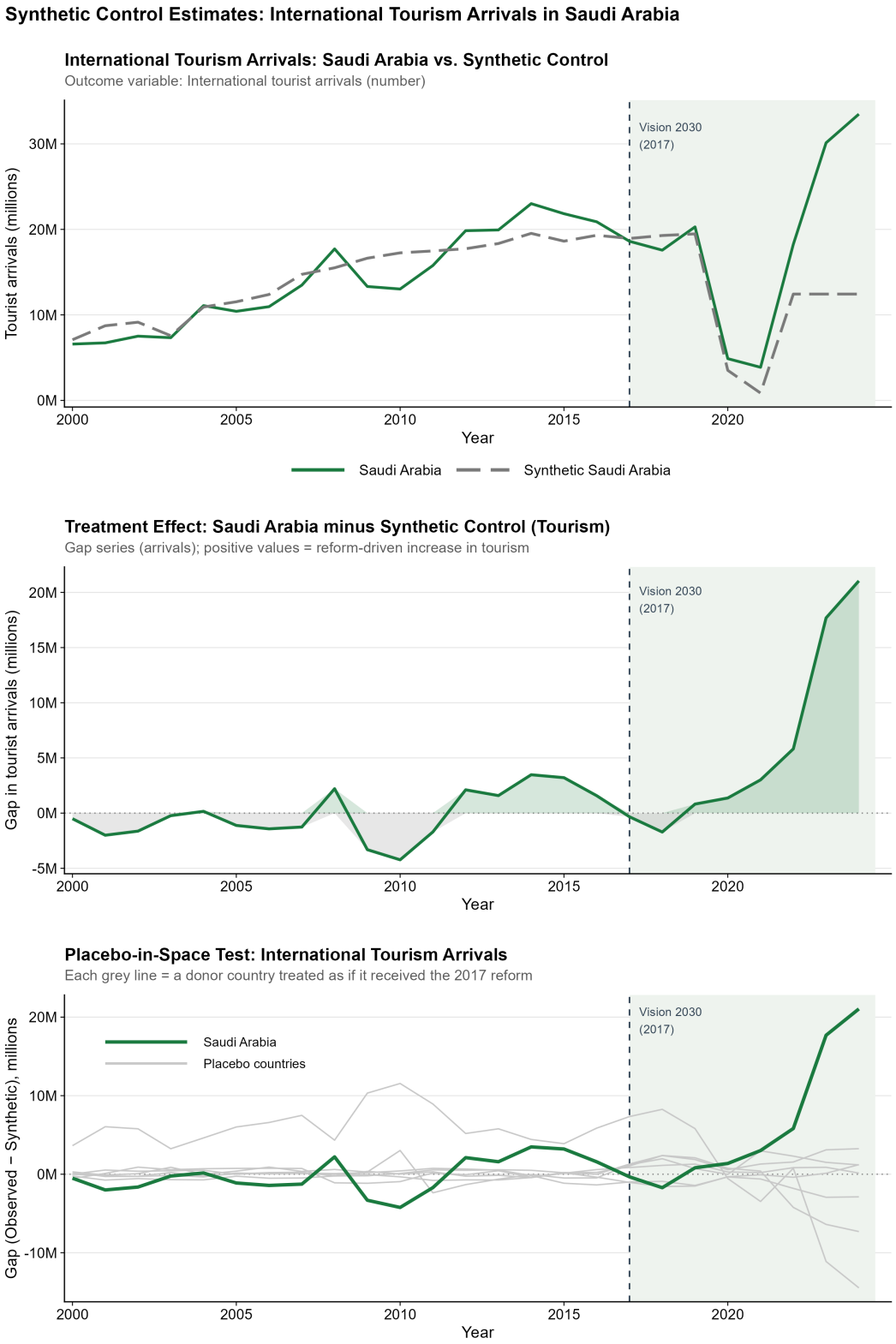
- The Post/Pre RMSPE ratio for Saudi Arabia is 8.01, which places it among the highest values in the donor pool (see Table 10 and Figure 8).
- The treatment dummy t-statistic confirms a statistically significant post-reform increase relative to the synthetic control (see Table 11).

The lower panel of Figure 3 presents placebo-in-space results showing that Saudi Arabia's post-reform gap is clearly larger than most placebo gaps. These results indicate that the increase in FDI inflows after the announcement phase of Vision 2030 is unlikely to be explained by common regional trends alone.

3.2.3 Tourism Development

Tourism arrivals (in levels) Before presenting the results of the main specification, we first estimate a synthetic control model using tourism arrivals in levels rather than logarithms. This specification allows the treatment effect to be interpreted directly in terms of the number of additional tourist arrivals. The main specification is then estimated using the logarithm of tourism arrivals, which improves the pre-treatment fit and allows the treatment effect to be interpreted in relative terms.

Figure 4: Results of Model 3A



Source: Author's calculations based on World Bank Data

Figure 4 presents the synthetic control estimates for international tourism arrivals in Saudi Arabia. The upper panel compares Saudi Arabia and its synthetic counterpart over the full sample period. The pre-treatment fit is close before 2017, which supports the credibility of the counterfactual trajectory (see

Table 19).

Predictor balance also confirms that the synthetic control reproduces well the main pre-treatment characteristics of Saudi Arabia (see Table 14), especially lagged tourism arrivals in 2000, 2005, 2010, and 2015.

After 2017, the trajectories diverge clearly:

- The treatment effect becomes negativly shortly after the reform period.
- The gap increases steadily in the following years.
- The divergence becomes particularly strong after 2019.
- The effect reaches its highest level by the end of the sample period (see Table 18).

This pattern is consistent with the progressive implementation of Vision 2030 tourism reforms, including visa liberalisation, investment in tourism infrastructure, and the development of new tourism destinations.

Robustness checks support these results:

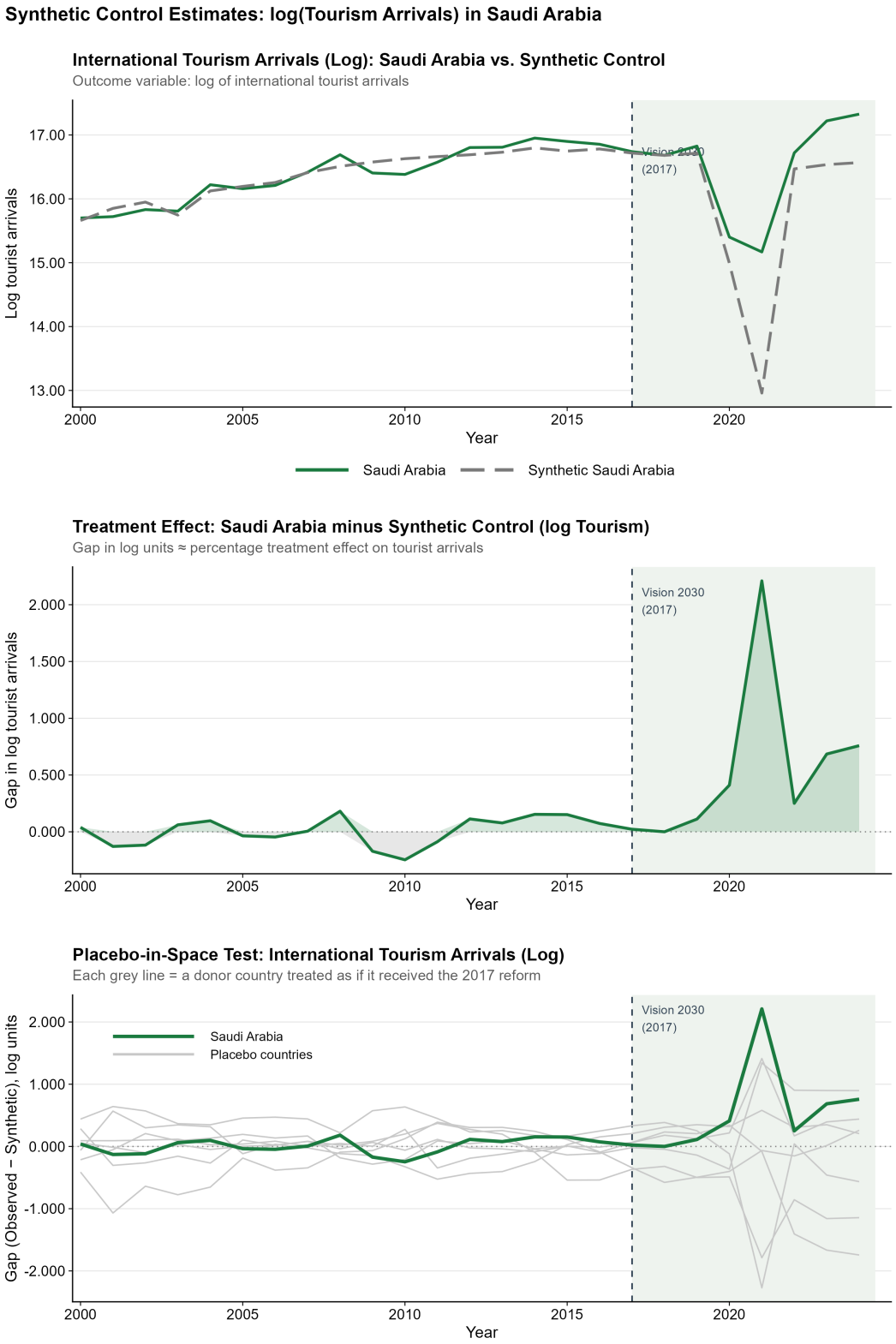
- The Post/Pre RMSPE ratio for Saudi Arabia is among the highest in the donor pool (see Table 16 and Figure 8).
- The treatment dummy t-statistic confirms a statistically significant post-reform increase relative to the synthetic control (see Table 17).

The lower panel of Figure 6 presents placebo-in-space results showing that Saudi Arabia's post-reform gap is clearly larger than most placebo gaps. These results indicate that the increase in tourism arrivals after Vision 2030 is unlikely to be explained by common regional trends alone.

Tourism arrivals (in logarithms) The main specification is estimated using the logarithm of tourism arrivals. The log transformation improves comparability across countries by reducing heteroskedasticity and stabilising the variance of tourism flows over time. It also improves the pre-treatment fit of the synthetic control and allows treatment effects to be interpreted in percentage terms rather than absolute levels.

In addition, the log specification reduces the influence of the large temporary decline in tourism during the COVID-19 period, which affects countries differently in levels but less strongly in relative terms. For these reasons, the log specification is used as the preferred model, while the levels specification presented above provides complementary evidence on the magnitude of the effect in absolute terms.

Figure 5: Results of Model 3B



Source: Author's calculations based on World Bank Data

Figure 5 presents the synthetic control estimates for the logarithm of international tourism arrivals in Saudi Arabia. The upper panel compares Saudi Arabia and its synthetic counterpart over the full sample period. The pre-treatment fit is very close before 2017, which supports the credibility of the counterfactual

trajectory (see Table 25).

Predictor balance confirms that the synthetic control reproduces well the main pre-treatment characteristics of Saudi Arabia (see Table 20). Compared with the specification in levels, the log transformation improves the stability of the pre-treatment match across the donor pool.

Robustness checks support these results:

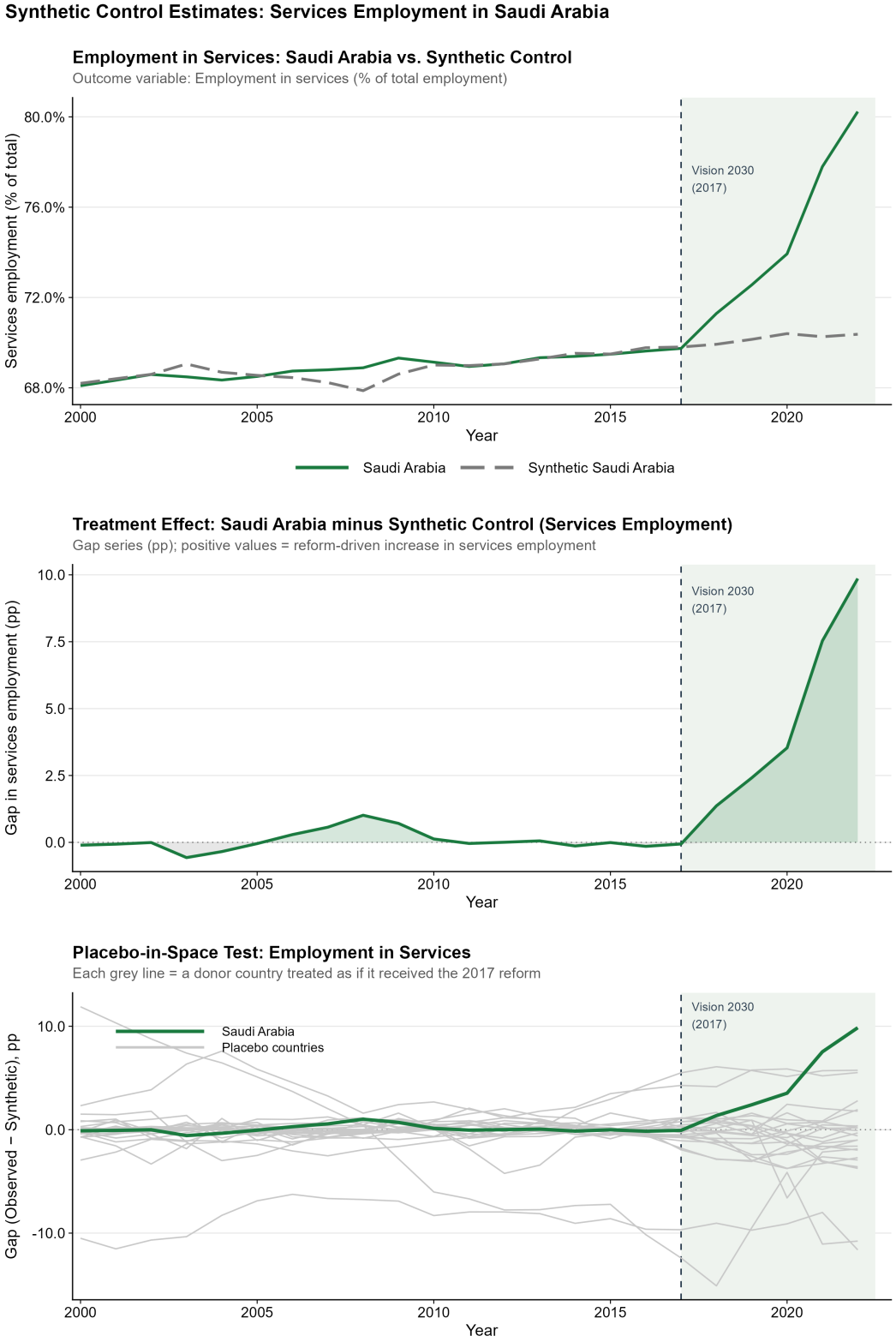
- The Post/Pre RMSPE ratio for Saudi Arabia is among the highest in the donor pool (see Table 22 and Figure 8).
- The treatment dummy t-statistic confirms a statistically significant post-reform increase relative to the synthetic control (see Table 23).

The lower panel of Figure 5 presents placebo-in-space results showing that Saudi Arabia's post-reform gap is clearly larger than most placebo gaps. This indicates that the post-2017 increase in tourism arrivals is unlikely to be explained by common regional trends alone.

3.2.4 Employment in Services

Compared with the previous specifications, the donor pool used for the services employment model includes a larger number of countries. This choice reflects the structural characteristics of the outcome variable. Employment in services as a share of total employment follows a broad global trend associated with structural transformation and the expansion of modern service sectors. Restricting the donor pool to a small group of resource-dependent economies would therefore limit the ability of the synthetic control to reproduce Saudi Arabia's pre-treatment trajectory.

Figure 6: Results of Model 4



Source: Author's calculations based on World Bank Data

Figure 6 presents the synthetic control estimates for employment in services in Saudi Arabia. The upper panel compares Saudi Arabia and its synthetic counterpart over the sample period. The pre-treatment fit is very close before 2017, which supports the credibility of the counterfactual trajectory (see Table 31).

Predictor balance confirms that the synthetic control reproduces well the main structural characteristics of Saudi Arabia before treatment (see Table 26). The use of a larger donor pool allows the synthetic control to better capture the long-run dynamics of structural transformation in services employment.

After 2017, the trajectories diverge clearly:

- The treatment effect becomes positive immediately after the reform period.
- The gap increases steadily from 2018 onward.
- The divergence accelerates after 2020.
- By the end of the sample period, the services employment share exceeds its synthetic counterfactual by a substantial margin (see Table 30).

This pattern is consistent with the objectives of Vision 2030 to promote economic diversification and expand private-sector employment opportunities, particularly in service-related activities.

Robustness checks strongly support these results:

- The Post/Pre RMSPE ratio for Saudi Arabia is the highest in the donor pool and exceeds the threshold typically associated with very strong treatment effects in the synthetic control literature (see Table 28 and Figure 9).
- The treatment dummy t-statistic confirms a statistically significant post-reform increase relative to the synthetic control (see Table 29).

The lower panel of Figure 6 presents placebo-in-space results showing that Saudi Arabia's post-reform gap is clearly larger than most placebo gaps. This indicates that the increase in services employment after Vision 2030 is unlikely to be explained by common structural trends affecting the donor countries.

4 Early Evidence of Success

Taken together, the synthetic control results provide consistent early evidence that Vision 2030 reforms contributed to measurable structural changes in several dimensions of the Saudi economy.

First, female labour force participation increased strongly relative to its counterfactual trajectory after 2017. The magnitude and persistence of the gap suggest that labour market reforms targeting mobility, legal access to employment, and workplace protections translated into real improvements in women's participation outcomes.

Second, foreign direct investment inflows show a clear upward deviation from the synthetic benchmark beginning already in 2016, which is consistent with anticipation effects by international investors. Because capital is highly mobile and reacts quickly to expected policy changes, this early response provides evidence that credibility signals associated with Vision 2030 influenced investor behavior even before full implementation of reforms.

Third, tourism arrivals increased substantially relative to the synthetic control after the reform period. The divergence becomes especially visible after 2019 and remains positive despite the temporary global shock associated with COVID-19. This pattern is consistent with the progressive opening of the tourism sector and regulatory reforms designed to attract international visitors.

Finally, employment in services increased markedly after 2017 compared with its counterfactual trajectory. This result is consistent with the structural transformation objective of Vision 2030, which explicitly targets the expansion of non-oil sectors and the development of private service activities.

Overall, these results should be interpreted as early evidence rather than final evaluation outcomes. Structural reforms typically operate with long adjustment horizons, but the consistency of the effects across labour markets, investment inflows, tourism activity, and sectoral employment suggests that Vision 2030 has already begun to reshape key components of the Saudi economic structure.

5 Conclusion

This paper evaluates the early macroeconomic effects of Vision 2030 using the synthetic control method to construct counterfactual trajectories for Saudi Arabia in the absence of reform. Across several outcome variables, including female labour force participation, foreign direct investment inflows, tourism development, and employment in services, the results provide consistent evidence of positive post-reform deviations relative to comparable countries.

These findings suggest that Vision 2030 has already generated measurable progress toward its central objectives of economic diversification, labour market inclusion, and private-sector expansion. At the same time, the results should be interpreted with caution. Structural transformation is a long-term process, and the full impact of institutional reforms, sectoral liberalisation, and investment policies will only become visible over a longer horizon.

Future work can extend this analysis in several directions. One promising approach would be to complement aggregate synthetic control evidence with international policy comparisons. In particular, the experience of China's entrepreneurial sector reforms during the 1990s illustrates how gradual institutional opening and incentives for private initiative can accelerate structural transformation [19]. Similarly, Norway's long-term strategy for managing resource revenues while supporting diversification into high-productivity sectors provides another relevant benchmark for resource-rich economies pursuing post-oil transitions.

Exploring these comparative policy experiences in greater detail may help identify which reform channels are most effective in sustaining diversification dynamics in Saudi Arabia. This remains an important direction for future research and may be addressed in upcoming papers.

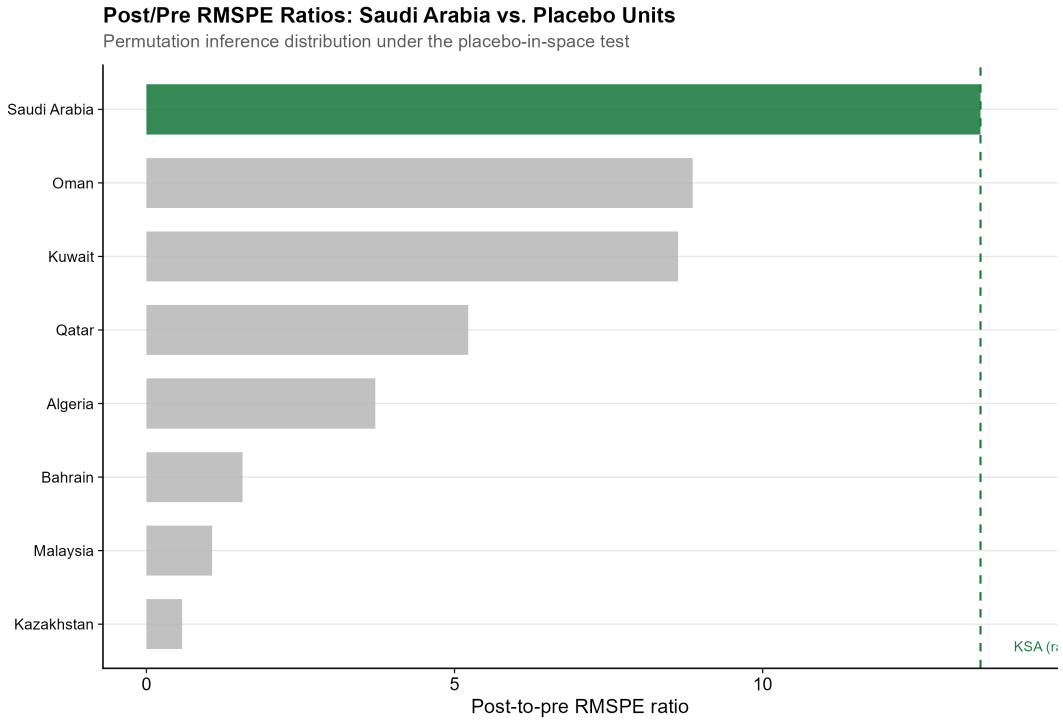
Replication and Transparency Statement

All data and replication materials used in this paper are publicly available and are provided together with the manuscript. The replication package includes the dataset, the full synthetic control implementation code, and all scripts required to reproduce the tables and figures reported in the paper.

Artificial intelligence tools were used as technical assistance during the preparation of this study, including support for parts of the coding workflow and for improving the clarity and structure of empirical interpretation. All modelling decisions, robustness checks, and conclusions remain the sole responsibility of the author.

Appendix

Figure 7: RMSPE Ratios



Source: Author's calculations based on World Bank Data

Table 2: Predictor Balance: Saudi Arabia vs. Synthetic Control

	Treated	Synthetic	Donor mean
Log GDP per capita	9.99	8.83	9.67
Fertility rate	3.16	2.85	2.54
Urban population share (%)	81.50	67.91	79.28
Female educational attainment	42.30	33.62	41.22
Oil rents (% of GDP)	41.50	26.22	25.21
FLFPR in 2000	17.04	16.65	40.57
FLFPR in 2005	17.74	17.64	41.75
FLFPR in 2010	18.38	19.26	44.22
FLFPR in 2015	22.46	21.07	46.98

Notes: Each row reports the pre-treatment period mean of a predictor for Saudi Arabia (Treated), its optimised synthetic counterpart (Synthetic), and the unweighted average of all donor countries (Donor mean). The synthetic control is constructed by minimising the pre-treatment root mean squared prediction error (RMSPE) of female LFPR. A close match between Treated and Synthetic confirms the synthetic control provides a credible counterfactual prior to the 2016 Vision 2030 reforms. FLFPR = Female Labour Force Participation Rate (% of women aged 15–64). Averages computed over 1991–2015.

Source: Author's calculations based on World Bank Data

Table 3: Donor Country Weights in the Synthetic Control

Weight	Country	unit.numbers	Cumulative weight
0.69	Algeria	1	0.69
0.31	Oman	6	1.00
0.00	Malaysia	5	1.00

Notes: Weights assigned to each donor country in constructing synthetic Saudi Arabia. Weights are optimised by minimising the pre-treatment RMSPE subject to non-negativity and the constraint that they sum to one (Abadie, Diamond & Hainmueller, 2010). Only countries with strictly positive weight are shown. The cumulative weight column shows the share of the synthetic control accounted for by the top contributors.

Source: Author's calculations based on World Bank Data

Table 4: Post/Pre RMSPE Ratios: Saudi Arabia and Placebo Countries

Country	Pre-RMSPE	Post-RMSPE	Post/Pre ratio	
Saudi Arabia	0.75	10.13	13.53	†
Oman	0.32	2.86	8.87	
Kuwait	0.51	4.40	8.63	
Qatar	1.11	5.82	5.22	
Algeria	3.88	14.43	3.72	
Bahrain	1.65	2.58	1.56	
Malaysia	1.40	1.50	1.07	
Kazakhstan	21.95	12.79	0.58	

Notes: Pre-RMSPE measures average prediction fit over 1991–2015; Post-RMSPE measures average deviation over 2016–2023. The Post/Pre ratio is the primary permutation test statistic: a high ratio for Saudi Arabia (†) relative to placebo units indicates the post-reform divergence is unlikely due to chance. Permutation p-value = 0.125 (proportion of placebo units with ratio $\geq$ Saudi Arabia's). Ratios >5 indicate strong effects; >10 indicate very strong effects.

Source: Author's calculations based on World Bank Data

Table 5: Treatment Dummy t-Statistics: Saudi Arabia and Placebo Countries

Country	t-statistic	p-value	Sig.	
Kazakhstan	-8.29	0.00	-8.293***	
Qatar	6.71	0.00	6.713***	
Algeria	-5.83	0.00	-5.826***	
Saudi Arabia	4.90	0.00	4.901***	†
Kuwait	-4.89	0.00	-4.889***	
Bahrain	-3.42	0.00	-3.416***	
Oman	-2.75	0.01	-2.752***	
Malaysia	1.29	0.21	1.291	

Notes: t-statistics from regressing the ratio of observed to synthetic FLFPR on a post-treatment dummy (1 from 2016 onward, 0 before), estimated for Saudi Arabia (†) and each donor country as a placebo. A large, significant positive t-statistic for Saudi Arabia combined with insignificant estimates for most placebo units supports a causal interpretation of the Vision 2030 reform effect. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Table 6: Estimated Annual Treatment Effects on Female LFPR (2016–2023)

Year	Saudi Arabia (observed)	Synthetic (counterfactual)	Treatment effect (pp)	% deviation
2016	23.75	21.14	2.60	12.31
2017	20.61	21.16	-0.55	-2.60
2018	22.70	21.07	1.63	7.72
2019	25.31	20.95	4.35	20.78
2020	30.44	19.49	10.94	56.15
2021	35.52	19.84	15.67	78.98
2022	35.41	20.96	14.45	68.93
2023	35.62	20.84	14.77	70.86

Notes: Treatment effect (pp) = Saudi Arabia observed FLFPR minus synthetic counterfactual, computed year by year. The % deviation expresses this as a share of the synthetic value. Positive values indicate female labour force participation exceeded the level expected absent the Vision 2030 reforms. Average annual treatment effect over 2016–2023: 7.98 pp. Cumulative effect: 63.87 pp.

Source: Author's calculations based on World Bank Data

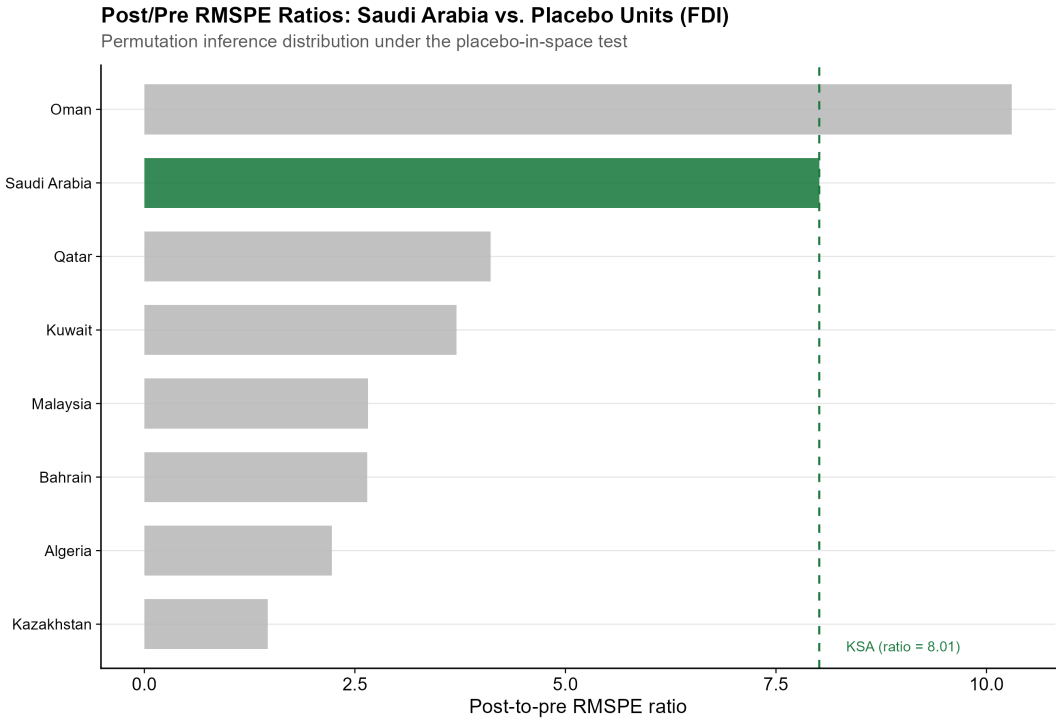
Table 7: Summary Inference Statistics: Synthetic Control Analysis

Statistic	Value
Pre-treatment RMSPE (Saudi Arabia)	0.7485
Post-treatment RMSPE (Saudi Arabia)	10.1308
Post/Pre RMSPE ratio (Saudi Arabia)	13.534
Permutation p-value (RMSPE-ratio test)	0.125
Treatment dummy t-statistic (Saudi Arabia)	4.901***
Average annual treatment effect (pp)	7.984
Cumulative treatment effect, 2016–2023 (pp)	63.871
Number of post-treatment years	8
Donor pool size (countries)	7

Notes: Pre- and post-treatment RMSPE quantify average prediction error before and after the 2016 Vision 2030 reforms. The Post/Pre RMSPE ratio is the main permutation test statistic; the p-value equals the share of placebo units with a ratio at least as large as Saudi Arabia's (see Table 4). A low p-value indicates the post-2016 FLFPR deviation is unlikely attributable to chance. The treatment dummy t-statistic tests whether the observed-to-synthetic ratio increases significantly after 2016 Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Figure 8: RMSPE Ratios



Source: Author's calculations based on World Bank Data

Table 8: Predictor Balance: Saudi Arabia vs. Synthetic Control (FDI Model)

	Treated	Synthetic	Donor mean
Log GDP per capita	10.00	9.66	9.70
Trade openness (% of GDP)	80.80	109.05	106.36
Government effectiveness (index)	48.04	55.90	53.48
Inflation rate (%)	3.15	3.16	3.93
Natural resource rents (% of GDP)	43.10	31.46	29.12
FDI in 2005 (3yr MA)	1154876576.59	1445141715.49	1650740245.10
FDI in 2010 (3yr MA)	3607076548.47	3600783916.28	4363764692.38
FDI in 2015 (3yr MA)	2950371876.15	2915562664.93	3227872037.08

Notes: Each row reports the pre-treatment period mean of a predictor for Saudi Arabia (Treated), its optimised synthetic counterpart (Synthetic), and the unweighted average of all donor countries (Donor mean). The synthetic control is constructed by minimising the pre-treatment root mean squared prediction error (RMSPE) of FDI net inflows. A close match between Treated and Synthetic confirms the synthetic control provides a credible counterfactual prior to the 2016 Vision 2030 reforms. FDI is smoothed with a 3-year moving average. Averages computed over 2002–2015.

Source: Author's calculations based on World Bank Data

Table 9: Donor Country Weights in the Synthetic Control (FDI Model)

Weight	Country	unit.numbers	Cumulative weight
0.72	Oman	6	0.72
0.20	Malaysia	5	0.92
0.08	Kazakhstan	3	0.99
0.00	Kuwait	4	1.00
0.00	Algeria	1	1.00

Notes: Weights assigned to each donor country in constructing synthetic Saudi Arabia for the FDI model. Weights are optimised by minimising the pre-treatment RMSPE subject to non-negativity and the constraint that they sum to one (Abadie, Diamond & Hainmueller, 2010). Only countries with strictly positive weight are shown. The cumulative weight column shows the share of the synthetic control accounted for by the top contributors.

Source: Author's calculations based on World Bank Data

Table 10: Post/Pre RMSPE Ratios: Saudi Arabia and Placebo Countries (FDI Model)

Country	Pre-RMSPE	Post-RMSPE	Post/Pre ratio	
Oman	387387669.30	3990344649.17	10.30	
Saudi Arabia	1011566236.71	8106380112.26	8.01	†
Qatar	1365642058.72	5617447879.63	4.11	
Kuwait	1203311269.41	4462144768.16	3.71	
Malaysia	2409554880.96	6396539515.38	2.65	
Bahrain	721482572.20	1909177853.14	2.65	
Algeria	470737019.36	1048823311.19	2.23	
Kazakhstan	3357907739.55	4925120522.56	1.47	

Notes: Pre-RMSPE measures average prediction fit over 2002–2015; Post-RMSPE measures average deviation over 2016–2023. The Post/Pre ratio is the primary permutation test statistic: a high ratio for Saudi Arabia (†) relative to placebo units indicates the post-reform divergence is unlikely due to chance. Permutation p-value = 0.25 (proportion of placebo units with ratio $\geq$ Saudi Arabia's). Ratios >5 indicate strong effects; >10 indicate very strong effects.

Source: Author's calculations based on World Bank Data

Table 11: Treatment Dummy t-Statistics: Saudi Arabia and Placebo Countries (FDI Model)

Country	t-statistic	p-value	Sig.	
Malaysia	5.50	0.00	5.502***	
Qatar	-5.15	0.00	-5.151***	
Saudi Arabia	4.36	0.00	4.362***	†
Oman	4.19	0.00	4.190***	
Kazakhstan	-3.54	0.00	-3.541***	
Bahrain	-1.80	0.09	-1.804*	
Algeria	-1.12	0.28	-1.118	
Kuwait	-1.05	0.30	-1.055	

Notes: t-statistics from regressing the ratio of observed to synthetic FDI on a post-treatment dummy (1 from 2016 onward, 0 before), estimated for Saudi Arabia (†) and each donor country as a placebo. A large, significant positive t-statistic for Saudi Arabia combined with insignificant estimates for most placebo units supports a causal interpretation of the Vision 2030 reform effect on FDI. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Table 12: Estimated Annual Treatment Effects on FDI Net Inflows (2016–2023)

Year	Saudi Arabia (observed)	Synthetic (counterfactual)	Treatment effect (USD)	% deviation
2016	9.14	3.40	5.75	168.95
2017	8.98	3.63	5.35	147.29
2018	11.70	5.22	6.48	124.10
2019	5.41	4.52	0.89	19.63
2020	5.61	4.00	1.61	40.39
2021	11.02	5.66	5.36	94.82
2022	18.89	7.25	11.65	160.76
2023	25.95	10.01	15.95	159.32

Notes: All FDI values are expressed in USD billions (3-year moving average). Treatment effect = Saudi Arabia observed FDI minus synthetic counterfactual, computed year by year. The % deviation expresses this as a share of the synthetic value. Positive values indicate FDI exceeded the level expected absent the Vision 2030 reforms. Average annual treatment effect over 2016–2023: 6.63 billion USD. Cumulative effect: 53.03 billion USD.

Source: Author's calculations based on World Bank Data

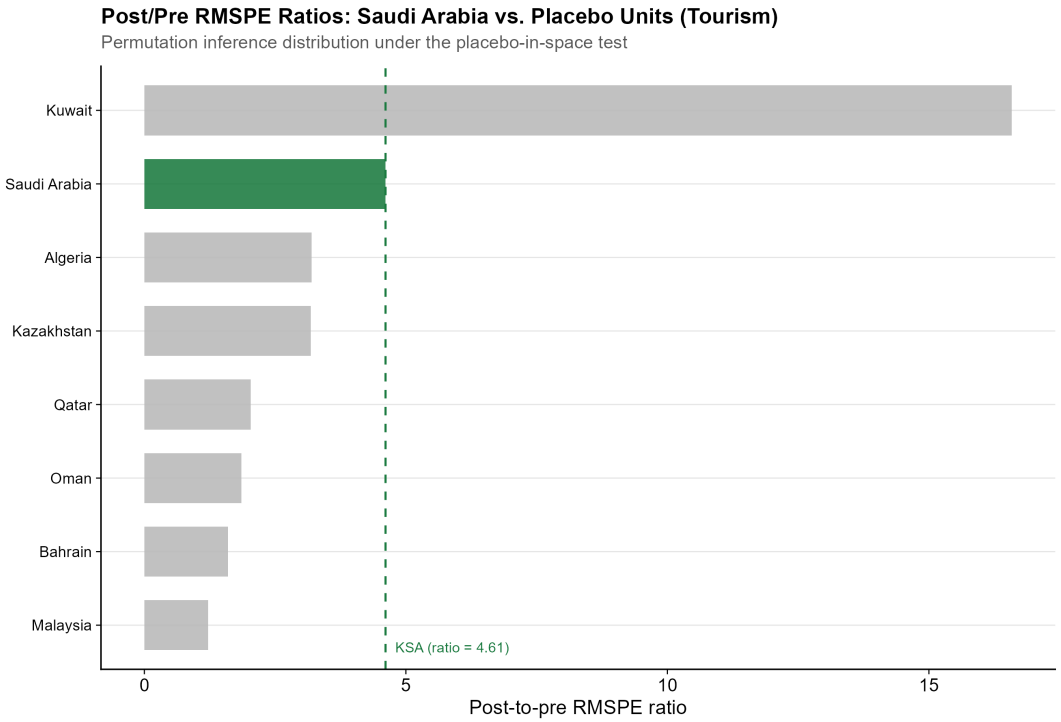
Table 13: Summary Inference Statistics: Synthetic Control Analysis (FDI Model)

Statistic	Value
Pre-treatment RMSPE (Saudi Arabia)	1.012e+09
Post-treatment RMSPE (Saudi Arabia)	8.106e+09
Post/Pre RMSPE ratio (Saudi Arabia)	8.014
Permutation p-value (RMSPE-ratio test)	0.25
Treatment dummy t-statistic (Saudi Arabia)	4.362***
Average annual treatment effect (USD billions)	6.629
Cumulative treatment effect, 2016–2023 (USD billions)	53.033
Number of post-treatment years	8
Donor pool size (countries)	7

Notes: Pre- and post-treatment RMSPE quantify average prediction error before and after the 2016 Vision 2030 reforms (expressed in current USD). The Post/Pre RMSPE ratio is the main permutation test statistic; the p-value equals the share of placebo units with a ratio at least as large as Saudi Arabia's (see Table 10). A low p-value indicates the post-2016 FDI deviation is unlikely attributable to chance. FDI values in the effects rows are expressed in USD billions. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Figure 9: RMSPE Ratios



Source: Author's calculations based on World Bank Data

Table 14: Predictor Balance: Saudi Arabia vs. Synthetic Control (Tourism Model)

	Treated	Synthetic	Donor mean
Log GDP per capita	10.00	9.52	9.68
Log population	16.94	16.25	15.53
Government effectiveness (index)	48.42	61.93	53.38
Tourism arrivals in 2000	6585000.00	7092984.25	2790428.57
Tourism arrivals in 2005	10417000.00	11533362.03	4862900.00
Tourism arrivals in 2010	13025000.00	17255677.19	7300571.43
Tourism arrivals in 2015	21834000.00	18622314.21	8006714.29

Notes: Each row reports the pre-treatment period mean of a predictor for Saudi Arabia (Treated), its optimised synthetic counterpart (Synthetic), and the unweighted average of all donor countries (Donor mean). The synthetic control is constructed by minimising the pre-treatment root mean squared prediction error (RMSPE) of tourist arrivals. A close match between Treated and Synthetic confirms the synthetic control provides a credible counterfactual prior to the 2017 Vision 2030 reforms. Averages computed over the full pre-treatment period.

Source: Author's calculations based on World Bank Data

Table 15: Donor Country Weights in the Synthetic Control (Tourism Model)

Weight	Country	unit.numbers	Cumulative weight
0.62	Malaysia	5	0.62
0.38	Kuwait	4	1.00

Notes: Weights assigned to each donor country in constructing synthetic Saudi Arabia for the tourism model. Weights are optimised by minimising the pre-treatment RMSPE subject to non-negativity and the constraint that they sum to one (Abadie, Diamond & Hainmueller, 2010). Only countries with strictly positive weight are shown. The cumulative weight column shows the share of the synthetic control accounted for by the top contributors.

Source: Author's calculations based on World Bank Data

Table 16: Post/Pre RMSPE Ratios: Saudi Arabia and Placebo Countries (Tourism Model)

Country	Pre-RMSPE	Post-RMSPE	Post/Pre ratio	
Kuwait	237146.85	3933432.73	16.59	
Saudi Arabia	2174774.42	10027087.29	4.61	†
Algeria	547168.61	1750175.72	3.20	
Kazakhstan	661175.21	2104507.73	3.18	
Qatar	477094.42	971620.45	2.04	
Oman	436751.14	812073.38	1.86	
Bahrain	1078949.89	1722436.79	1.60	
Malaysia	6503597.72	7916886.29	1.22	

Notes: Pre-RMSPE measures average prediction fit over the pre-treatment period; Post-RMSPE measures average deviation over 2017–2024. The Post/Pre ratio is the primary permutation test statistic: a high ratio for Saudi Arabia (†) relative to placebo units indicates the post-reform divergence is unlikely due to chance. Permutation p-value = 0.25 (proportion of placebo units with ratio $\geq$ Saudi Arabia's). Ratios >5 indicate strong effects; >10 indicate very strong effects.

Source: Author's calculations based on World Bank Data

Table 17: Treatment Dummy t-Statistics: Saudi Arabia and Placebo Countries (Tourism Model)

Country	t-statistic	p-value	Sig.	
Algeria	-4.97	0.00	-4.969***	
Malaysia	-4.11	0.00	-4.113***	
Kazakhstan	3.61	0.00	3.609***	
Saudi Arabia	3.23	0.00	3.228***	†
Oman	2.15	0.04	2.146**	
Bahrain	1.78	0.09	1.781*	
Kuwait	-0.52	0.60	-0.525	
Qatar	-0.20	0.84	-0.204	

Notes: t-statistics from regressing the ratio of observed to synthetic tourist arrivals on a post-treatment dummy (1 from 2017 onward, 0 before), estimated for Saudi Arabia (†) and each donor country as a placebo. A large, significant positive t-statistic for Saudi Arabia combined with insignificant estimates for most placebo units supports a causal interpretation of the Vision 2030 reform effect on tourism. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Table 18: Estimated Annual Treatment Effects on Tourist Arrivals (2017–2024)

Year	Saudi Arabia (observed)	Synthetic (counterfactual)	Treatment effect (arrivals)	% deviation
2017	18.61	18.94	-0.33	-1.76
2018	17.57	19.28	-1.71	-8.89
2019	20.29	19.47	0.82	4.21
2020	4.88	3.51	1.37	39.00
2021	3.87	0.85	3.01	352.37
2022	18.26	12.44	5.82	46.81
2023	30.12	12.44	17.69	142.26
2024	33.48	12.44	21.04	169.23

Notes: All values expressed in millions of tourist arrivals. Treatment effect = Saudi Arabia observed arrivals minus synthetic counterfactual, computed year by year. The % deviation expresses this as a share of the synthetic value. Positive values indicate tourist arrivals exceeded the level expected absent the Vision 2030 reforms. Average annual treatment effect over 2017–2024: 5.96 million arrivals. Cumulative effect: 47.71 million arrivals.

Source: Author's calculations based on World Bank Data

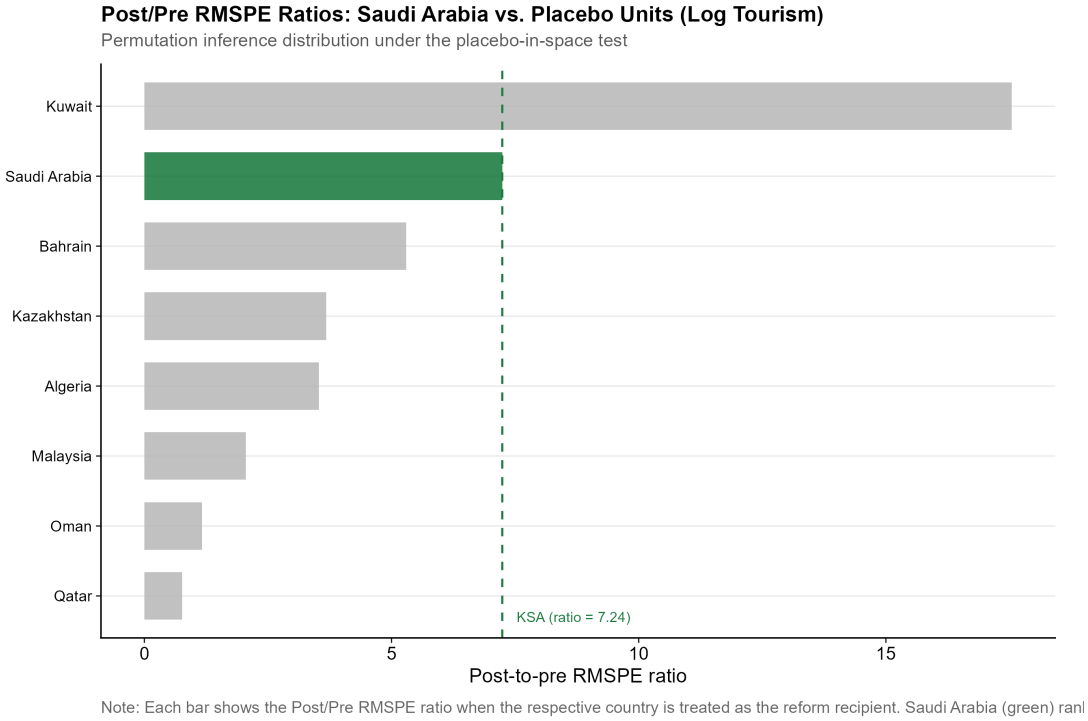
Table 19: Summary Inference Statistics: Synthetic Control Analysis (Tourism Model)

Statistic	Value
Pre-treatment RMSPE (Saudi Arabia)	2.175e+06
Post-treatment RMSPE (Saudi Arabia)	1.003e+07
Post/Pre RMSPE ratio (Saudi Arabia)	4.611
Permutation p-value (RMSPE-ratio test)	0.25
Treatment dummy t-statistic (Saudi Arabia)	3.228***
Average annual treatment effect (millions of arrivals)	5.964
Cumulative treatment effect, 2017–2024 (millions of arrivals)	47.711
Number of post-treatment years	8
Donor pool size (countries)	7

Notes: Pre- and post-treatment RMSPE quantify average prediction error before and after the 2017 Vision 2030 reforms (expressed in number of arrivals). The Post/Pre RMSPE ratio is the main permutation test statistic; the p-value equals the share of placebo units with a ratio at least as large as Saudi Arabia's (see Table 16). A low p-value indicates the post-2017 tourism deviation is unlikely attributable to chance. Effect rows are expressed in millions of international tourist arrivals. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Figure 10: RMSPE Ratios



Source: Author's calculations based on World Bank Data

Table 20: Predictor Balance: Saudi Arabia vs. Synthetic Control (Log Tourism Model)

	Treated	Synthetic	Donor mean
Log GDP per capita	10.00	9.27	9.68
Log population	16.94	16.68	15.53
Government effectiveness (index)	48.42	67.53	53.38
Log tourism arrivals in 2000	15.70	15.66	14.27
Log tourism arrivals in 2005	16.16	16.20	14.92
Log tourism arrivals in 2010	16.38	16.63	15.30
Log tourism arrivals in 2015	16.90	16.75	15.52

Notes: Each row reports the pre-treatment period mean of a predictor for Saudi Arabia (Treated), its optimised synthetic counterpart (Synthetic), and the unweighted average of all donor countries (Donor mean). The synthetic control is constructed by minimising the pre-treatment root mean squared prediction error (RMSPE) of log tourist arrivals. All tourism predictors are in natural logarithms. A close match between Treated and Synthetic confirms the synthetic control provides a credible counterfactual prior to the 2017 Vision 2030 reforms. Averages computed over the full pre-treatment period.

Source: Author's calculations based on World Bank Data

Table 21: Donor Country Weights in the Synthetic Control (Log Tourism Model)

Weight	Country	unit.numbers	Cumulative weight
0.85	Malaysia	5	0.85
0.14	Qatar	7	1.00

Notes: Weights assigned to each donor country in constructing synthetic Saudi Arabia for the log tourism model. Weights are optimised by minimising the pre-treatment RMSPE subject to non-negativity and the constraint that they sum to one (Abadie, Diamond & Hainmueller, 2010). Only countries with strictly positive weight are shown. The cumulative weight column shows the share of the synthetic control accounted for by the top contributors.

Source: Author's calculations based on World Bank Data

Table 22: Post/Pre RMSPE Ratios: Saudi Arabia and Placebo Countries (Log Tourism Model)

Country	Pre-RMSPE	Post-RMSPE	Post/Pre ratio	
Kuwait	0.06	1.00	17.55	
Saudi Arabia	0.12	0.88	7.24	†
Bahrain	0.14	0.74	5.30	
Kazakhstan	0.15	0.56	3.68	
Algeria	0.27	0.96	3.53	
Malaysia	0.42	0.87	2.06	
Oman	0.30	0.35	1.16	
Qatar	0.45	0.34	0.76	

Notes: Pre-RMSPE measures average prediction fit over the pre-treatment period; Post-RMSPE measures average deviation over 2017–2024. Both are in log units. The Post/Pre ratio is the primary permutation test statistic: a high ratio for Saudi Arabia (†) relative to placebo units indicates the post-reform divergence is unlikely due to chance. Permutation p-value = 0.25 (proportion of placebo units with ratio $\geq$ Saudi Arabia's). Ratios >5 indicate strong effects; >10 indicate very strong effects.

Source: Author's calculations based on World Bank Data

Table 23: Treatment Dummy t-Statistics: Saudi Arabia and Placebo Countries (Log Tourism Model)

Country	t-statistic	p-value	Sig.	
Algeria	-4.91	0.00	-4.909***	
Oman	3.16	0.00	3.162***	
Malaysia	-3.16	0.00	-3.160***	
Kazakhstan	2.94	0.01	2.937***	
Saudi Arabia	2.82	0.01	2.817***	†
Bahrain	2.73	0.01	2.735***	
Kuwait	-2.26	0.03	-2.262**	
Qatar	-0.11	0.91	-0.112	

Notes: t-statistics from regressing the ratio of observed to synthetic log tourist arrivals on a post-treatment dummy (1 from 2017 onward, 0 before), estimated for Saudi Arabia (†) and each donor country as a placebo. A large, significant positive t-statistic for Saudi Arabia combined with insignificant estimates for most placebo units supports a causal interpretation of the Vision 2030 reform effect on tourism. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Table 24: Estimated Annual Treatment Effects on log(Tourism Arrivals) (2017–2024)

Year	Saudi Arabia (observed)	Synthetic (counterfactual)	Treatment effect (log)	% effect
2017	16.74	16.72	0.02	2.27
2018	16.68	16.68	0.00	0.02
2019	16.83	16.71	0.11	11.85
2020	15.40	14.99	0.41	50.84
2021	15.17	12.96	2.21	811.52
2022	16.72	16.47	0.25	28.50
2023	17.22	16.54	0.68	98.38
2024	17.33	16.57	0.76	113.51

Notes: Treatment effect (log) = Saudi Arabia observed log-tourism minus synthetic counterfactual, computed year by year. The % effect column converts the log gap to an exact percentage using $100 \times (e^{gap} - 1)$, giving the percentage by which observed arrivals exceeded the counterfactual. Positive values indicate tourism exceeded what would have been expected absent the Vision 2030 reforms. Average annual treatment effect over 2017–2024: 0.5562 log units (74.41%). Cumulative effect: 4.4499 log units.

Source: Author's calculations based on World Bank Data

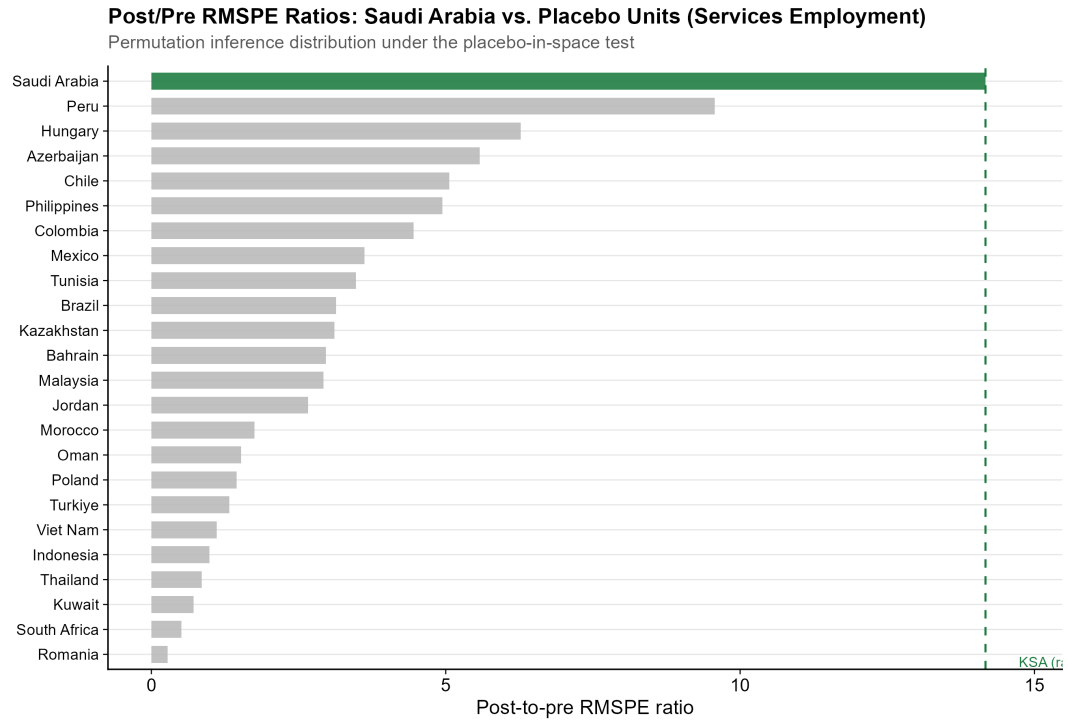
Table 25: Summary Inference Statistics: Synthetic Control Analysis (Log Tourism Model)

Statistic	Value
Pre-treatment RMSPE (Saudi Arabia)	0.1213
Post-treatment RMSPE (Saudi Arabia)	0.8784
Post/Pre RMSPE ratio (Saudi Arabia)	7.24
Permutation p-value (RMSPE-ratio test)	0.25
Treatment dummy t-statistic (Saudi Arabia)	2.817***
Average annual treatment effect (log units)	0.5562
Average annual treatment effect (% equivalent)	74.41%
Cumulative treatment effect, 2017–2024 (log units)	4.4499
Number of post-treatment years	8
Donor pool size (countries)	7

Notes: Pre- and post-treatment RMSPE are in log units. The Post/Pre RMSPE ratio is the main permutation test statistic; the p-value equals the share of placebo units with a ratio at least as large as Saudi Arabia's (see Table 22). A low p-value indicates the post-2017 log-tourism deviation is unlikely attributable to chance. The % equivalent row converts the average log-unit effect to a percentage via $100 \times (e^{gap} - 1)$. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Figure 11: RMSPE Ratios



Source: Author's calculations based on World Bank Data

Table 26: Predictor Balance: Saudi Arabia vs. Synthetic Control (Services Employment Model)

	Treated	Synthetic	Donor mean
Government effectiveness (index)	48.42	60.65	52.33
Secondary education attainment (%)	96.99	95.05	88.02
Inflation rate (%)	2.59	3.90	5.06
Female labour force participation rate (%)	18.77	49.31	49.96
Services value added (% of GDP)	39.50	53.05	51.43
Services employment in 2000 (%)	68.09	68.20	53.43
Services employment in 2005 (%)	68.50	68.55	54.71
Services employment in 2010 (%)	69.14	69.01	55.80
Services employment in 2015 (%)	69.49	69.50	57.83

Notes: Each row reports the pre-treatment period mean of a predictor for Saudi Arabia (Treated), its optimised synthetic counterpart (Synthetic), and the unweighted average of all donor countries (Donor mean). The synthetic control is constructed by minimising the pre-treatment root mean squared prediction error (RMSPE) of services employment. A close match between Treated and Synthetic confirms the synthetic control provides a credible counterfactual prior to the 2017 Vision 2030 reforms. Averages computed over the full pre-treatment period.

Source: Author's calculations based on World Bank Data

Table 27: Donor Country Weights in the Synthetic Control (Services Employment Model)

Weight	Country	unit.numbers	Cumulative weight
0.32	Kuwait	10	0.32
0.28	Chile	4	0.61
0.18	Hungary	6	0.79
0.07	Jordan	8	0.86
0.05	South Africa	20	0.91
0.04	Brazil	3	0.96
0.01	Peru	15	0.97
0.01	Malaysia	11	0.97
0.00	Mexico	12	0.98
0.00	Colombia	5	0.98
0.00	Poland	17	0.99
0.00	Kazakhstan	9	0.99
0.00	Philippines	16	0.99
0.00	Romania	18	0.99
0.00	Azerbaijan	1	0.99
0.00	Bahrain	2	0.99
0.00	Indonesia	7	0.99
0.00	Morocco	13	1.00
0.00	Thailand	21	1.00
0.00	Tunisia	22	1.00
0.00	Turkiye	23	1.00
0.00	Viet Nam	24	1.00

Notes: Weights assigned to each donor country in constructing synthetic Saudi Arabia for the services employment model. Weights are optimised by minimising the pre-treatment RMSPE subject to non-negativity and the constraint that they sum to one (Abadie, Diamond & Hainmueller, 2010). Only countries with strictly positive weight are shown. The cumulative weight column shows the share of the synthetic control accounted for by the top contributors.

Source: Author's calculations based on World Bank Data

Table 28: Post/Pre RMSPE Ratios: Saudi Arabia and Placebo Countries (Services Employment Model)

Country	Pre-RMSPE	Post-RMSPE	Post/Pre ratio	
Saudi Arabia	0.38	5.39	14.17	†
Peru	0.32	3.02	9.57	
Hungary	0.36	2.24	6.27	
Azerbaijan	0.47	2.62	5.58	
Chile	0.41	2.07	5.06	
Philippines	0.11	0.56	4.95	
Colombia	0.50	2.23	4.46	
Mexico	0.59	2.14	3.62	
Tunisia	0.46	1.61	3.47	
Brazil	0.23	0.73	3.14	
Kazakhstan	1.82	5.66	3.11	
Bahrain	0.34	0.99	2.96	
Malaysia	0.52	1.53	2.92	
Jordan	1.95	5.18	2.66	
Morocco	0.84	1.47	1.75	
Oman	7.21	11.01	1.53	
Poland	0.35	0.50	1.45	
Turkiye	0.87	1.15	1.32	
Viet Nam	8.63	9.59	1.11	
Indonesia	0.73	0.72	0.99	
Thailand	1.45	1.24	0.86	
Kuwait	3.57	2.55	0.71	
South Africa	1.30	0.67	0.51	
Romania	1.26	0.34	0.27	

Notes: Pre-RMSPE measures average prediction fit over the pre-treatment period; Post-RMSPE measures average deviation over 2017–2022. Both are in percentage points. The Post/Pre ratio is the primary permutation test statistic: a high ratio for Saudi Arabia (†) relative to placebo units indicates the post-reform divergence is unlikely due to chance. Permutation p-value = 0.042 (proportion of placebo units with ratio $\geq$ Saudi Arabia's). Ratios >5 indicate strong effects; >10 indicate very strong effects.

Source: Author's calculations based on World Bank Data

Table 29: Treatment Dummy t-Statistics: Saudi Arabia and Placebo Countries (Services Employment Model)

Country	t-statistic	p-value	Sig.	
Hungary	-9.82	0.00	-9.816***	
Colombia	-8.60	0.00	-8.601***	
Kazakhstan	7.00	0.00	6.995***	
Azerbaijan	-6.89	0.00	-6.888***	
Jordan	5.58	0.00	5.575***	
Mexico	-5.46	0.00	-5.463***	
Tunisia	-5.10	0.00	-5.100***	
Kuwait	-4.89	0.00	-4.892***	
Saudi Arabia	4.48	0.00	4.480***	†
Oman	-3.34	0.00	-3.337***	
Malaysia	2.85	0.01	2.854***	
Morocco	2.85	0.01	2.846***	
Turkiye	2.38	0.03	2.385**	
Chile	-1.99	0.06	-1.988**	
Peru	-1.66	0.11	-1.664*	
Philippines	0.98	0.34	0.977	
Poland	-0.91	0.38	-0.906	
Viet Nam	0.84	0.41	0.838	
Bahrain	0.50	0.62	0.501	
Indonesia	0.49	0.63	0.494	
Thailand	-0.48	0.64	-0.477	
Romania	0.39	0.70	0.386	
South Africa	-0.35	0.73	-0.352	
Brazil	-0.08	0.94	-0.081	

Notes: t-statistics from regressing the ratio of observed to synthetic services employment on a post-treatment dummy (1 from 2017 onward, 0 before), estimated for Saudi Arabia (†) and each donor country as a placebo. A large, significant positive t-statistic for Saudi Arabia combined with insignificant estimates for most placebo units supports a causal interpretation of the Vision 2030 reform effect on services employment. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

Table 30: Estimated Annual Treatment Effects on Services Employment (2017–2022)

Year	Saudi Arabia (observed)	Synthetic (counterfactual)	Treatment effect (pp)	% deviation
2017	69.75	69.81	-0.06	-0.09
2018	71.29	69.93	1.36	1.95
2019	72.56	70.14	2.41	3.44
2020	73.93	70.40	3.53	5.02
2021	77.80	70.26	7.53	10.72
2022	80.23	70.37	9.86	14.01

Notes: All values expressed in percentage points (% of total employment). Treatment effect (pp) = Saudi Arabia observed services employment share minus synthetic counterfactual, computed year by year. The % deviation expresses this as a share of the synthetic value. Positive values indicate services employment exceeded the level expected absent the Vision 2030 economic diversification reforms. Average annual treatment effect over 2017–2022: 4.11 pp. Cumulative effect: 24.64 pp.

Source: Author's calculations based on World Bank Data

Table 31: Summary Inference Statistics: Synthetic Control Analysis (Services Employment Model)

Statistic	Value
Pre-treatment RMSPE (Saudi Arabia)	0.3803
Post-treatment RMSPE (Saudi Arabia)	5.3876
Post/Pre RMSPE ratio (Saudi Arabia)	14.168
Permutation p-value (RMSPE-ratio test)	0.042
Treatment dummy t-statistic (Saudi Arabia)	4.480***
Average annual treatment effect (pp)	4.107
Cumulative treatment effect, 2017–2022 (pp)	24.642
Number of post-treatment years	6
Donor pool size (countries)	23

Notes: Pre- and post-treatment RMSPE are in percentage points. The Post/Pre RMSPE ratio is the main permutation test statistic; the p-value equals the share of placebo units with a ratio at least as large as Saudi Arabia's (see Table 28). A low p-value indicates the post-2017 services employment deviation is unlikely attributable to chance. Effects are reported in percentage points of total employment. Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations based on World Bank Data

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