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Policy changes and growth slowdown: assessing Chile's lost decade

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"Development is a voyage with more castaways than navigators." Eduardo Galeano.

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Abstract
Latin America has been snared in an economic slowdown since the end of the commodities boom. Within the region, Chile used to stand alone as the poster child of economic growth and political stability from 1990 to 2010. However, a stark contrast is perceived since around 2014, as Chile has also been trapped in a decade of slow economic growth, marking a shift in its economic trend. This paper examines this Chilean slowdown from an empirical perspective and determines how much can be attributed to internal and external causes. Using the Synthetic Control Method (SCM), our empirical analysis suggests that at least two-thirds of Chile's recent slowdown can be attributed to internal causes (i.e., policy regime change) and only one-third to external ones. Our results are consistent with the literature, confirming that external volatility can explain only a small fraction of poor economic performance, suggesting that internal factors are the primary source. This research sheds light on the effects of policy regime shifts and their economic impact.

Keywords Growth slowdown · Policy regime change · Middle-income trap · Latin America · Synthetic control method

JEL Classification C21 · C22 · D78 · N460 · O11 · O43

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1 Introduction

The Latin American region has recently experienced tumultuous political and economic events, which have hindered its ability to achieve democratic stability, generate economic growth, and promote widespread prosperity. The recent decade has been coined Latin America's "new lost decade" (Ocampo 2021). The region is also highly dependent on commodities, and as such, it benefited from the commodities' super-cycle from the early 2000s up until 2012–2013 (Erten and Ocampo 2013; Gruss 2014). From then onwards, many countries in the region have experienced the effects of the end of the super-cycle, leaving behind the period of broad prosperity recorded since the early 2000s, during what was called the "golden era" (Gruss 2014).

The end of this period has led to a new phase of high political instability and social unrest in Latin America (Paniagua 2021). In this context, political leaders often blame external factors for the poor economic performance of their governments and internal factors for the good ones (Chumacero 2019; Raddatz 2007). Recently, one of the most interesting cases of this phenomenon has been in Chile. Chile has experienced weak economic growth, political volatility, and protests since at least the mid-2010s, and more acutely since 2019. However, since the early 1990s (see De Gregorio 2005), Chile used to be the poster child of economic growth, political stability, and development, at least up until 2014 (Cortázar 2019). The country experienced impressive economic growth since the return of democracy in 1990 to the mid-2010s, growing faster than the world and its Latin American counterparts (De Gregorio 2005). This period of accelerated modernization has been defined as the "Chilean miracle" (Edwards 2023). However, Chile has recently experienced a sudden slowdown in its economic growth trajectory, meaning that the country deviated from its previous 1990–2013 growth path. This phenomenon has come to be known as Chile's "lost decade," in which the country has been snared by slow growth and low productivity (Toni 2024; Claro and Sanhueza 2023).

What makes the Chilean case noteworthy is that its recent "lost decade" coincided with two relevant events: (i) the worsening of external conditions, reflected in the fall in the price of commodities (particularly copper) from 2012 onwards, and (ii) the materialization in 2014 of a battery of structural reforms during Michelle Bachelet's second government (2014–2018), which entailed a non-trivial change in public policy. The concomitance of these events poses a puzzle for political scientists and economists interested in growth reversals and political changes: What happened to Chile in the recent decade? Chile's economic puzzle remains understudied from a quantitative and empirical perspective at the intersection between politics and economics; thus, Chile's "growth slowdown" (Eichengreen et al. 2014) has been ignored by political economists. This paper seeks to fill that gap in the literature by using a synthetic control approach and estimation (Abadie 2021).

The goal of this paper is twofold: first, to determine the time at which the slowdown in economic growth occurred in Chile, and second, to identify how much weight can be attributed to internal and external factors in driving this phenomenon. Consequently, this paper contributes to the literature on political changes and growth (Aiyar et al. 2013; Barro 1999; Rodrik 1999); while also contributing to the "growth slowdown" literature (Eichengreen et al. 2014) by assessing how policy regime changes (Wilson 2000) could

affect economic performance (Spruk 2019; Easterly 1992; Gemmell et al. 2011).[1] Even though this paper focuses on Chile's recent "lost decade", the Chilean case is indicative of a broader challenge that has affected most of the region: the rise of far-reaching policy regime shifts, often led by populist regimes, that seek to implement new (and often risky) economic strategies or development models by breaking away from previous consensus, as if countries were blank slates (Edwards 2019; Cachanosky et al. 2025; Granés 2022; Lehto and Paniagua 2025). These policy shifts have often led to a deterioration in both the performance of market institutions and the liberal-democratic institutional quality of many Latin American countries, with severe consequences on the well-being of their citizens (see Cachanosky et al. 2025; Spruk 2019; Absher et al. 2020; Grier and Maynard 2016).

The paper proceed as follows. Section 2 explores the Chilean puzzle of the last decade: using political and historical narrative and the descriptive statistics of the Chilean economy, we show its slowdown in growth and explore the policy changes enacted during 2014. Section 3 develops the Synthetic Control Method (SCM) to assess the timing and quantify Chile's growth slowdown. Our main results suggest that at least two-thirds of Chile's slowdown can be attributed to internal causes and only one-third to external ones. This translated into Chile being $1.345 (per capita) poorer than predicted by synthetic counterfactuals. Section 4 concludes.

2 The growth slowdown: stylized facts and policy changes

Chile's recent economic trajectory is a modern paradox in economic performance, transitioning from a rapid (above world's average) boom in economic growth during 1985–2013 towards a sudden slowdown from 2014 onwards (below world's average) (Edwards 2023; Paniagua 2021). This growth slowdown is historically represented in Fig. 1, which shows Chile's per capita GDP growth from 1952 until 2019. The figure shows the historical evolution of the annual growth rate of GDP per capita in Chile and its trend applying the Hodrick-Prescott filter. The vertical dotted lines mark the break years identified by the Bai and Perron (1998) structural break test applied to the filtered series for the recent growth period (1985–2019). The break points detected by the test are the years 1989, 1997, 2009 and 2014, suggesting a potential break in the trend around the year 2014. The latter break point is consistent with the intervention year used in this paper (see also Appendix).[2]

From 2014 onwards, Chile's output grew at 0.6% per year, while the world grew at 1.9%. The above is the reason why the period 2014–2024 has been labeled as the "lost decade" (Claro and Sanhueza 2023). The evidence indicates that this last decade has been the worst concerning economic growth since the politically turbulent 1970s (Edwards 2023; Paniagua 2021). Chile's recent "lost decade" is also the period in which economic growth per capita was reduced to more than a fifth in comparison with the "miracle" period of 1985–2000 (Claro and Sanhueza 2023). Figure 2 displays such dynamics in terms of

[1] According to Wilson (2000) a "policy regime change" consists of "the abrupt episodes of substantial-change [which] occurs with changes in the policy paradigm, alterations in patterns of power and shifts in organizational arrangements". See Sect. 2.1 for more details.

[2] The existence of such breakpoints implies that the growth trend changed with respect to previous periods with a significance greater than 5%. A single constant model was used, applying sequential evaluation, 0.15 trimming, and allowing 1–5 structural breaks. The results of the Bayesian Information Criterion (BIC) for the test suggest that the model with 4 breaks is the best fit among the alternatives considered.

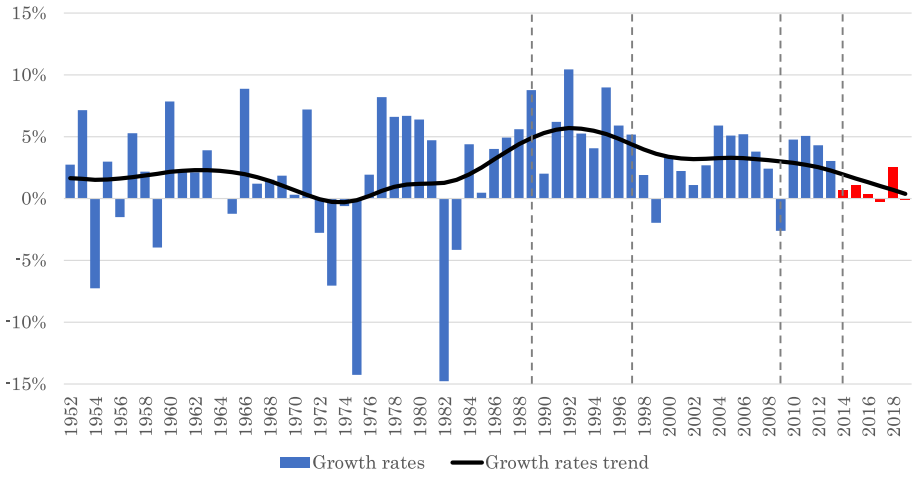

Fig. 1 Chile's real GDP per capita growth rates, 1952–2019. The solid black line shows the trend component estimates using the Hodrick-Prescott filter, assuming a parameter $\lambda = 100$. Vertical dotted lines mark the structural breaks identified for the 1985–2019 period using the Bai-Perron multiple breakpoint test. Authors' elaboration based on Penn World Tables 10.01

Chile's real GDP per capita. In the last decade, Chile has stopped converging towards developed economies and has begun to diverge (see also Appendix). This phenomenon poses a puzzle at the intersection of politics and economics: how much lower growth can be attributed to internal factors (such as internal policy changes) and how much can be explained by external factors (such as the end of the commodities' super-cycle). The remainder of this paper explores this question.

2.1 The Chilean puzzle: domestic or external factors?

Since the end of the commodity super-cycle, a debate has spurred about the causes and consequences of the economic slowdown that the Latin-American region has suffered (Chumacero 2019; Gruss 2014; Roch 2017, 2019). Didier et al. (2016) argue that the slowdown is synchronous and protracted in emergent economies, affecting many emerging markets, particularly large ones. Chile has experienced a mixture of shocks. From the external side, the biggest one has been the end of the commodities super-cycle (2012–2013), which negatively affected the Chilean economy. As a major exporter of copper, Chile experienced a decline in revenue when global demand for commodities, particularly from China, began to wane.[3] Between 2011 and 2016, the price of copper fell by nearly 50%, from approximately $4 per pound to $2.25 per pound.

After 2011, the prices of commodities declined; thus, the 'commodity shock,' Roch (2017) argues, resulted in lower national incomes, wider current account deficits, and weaker currencies for Chile, Peru, and Colombia (ibid. 3). Within this bleak regional context, some economists (see Roch 2017; Rivera 2017) have argued that Chile's sudden change in growth forms part of this regional trend rather than responding to internal

[3] To put things in perspective, between 1996 and 2015, copper mining accounted for an average of 10% of Chile's gross domestic product (GDP) (Association 2017).

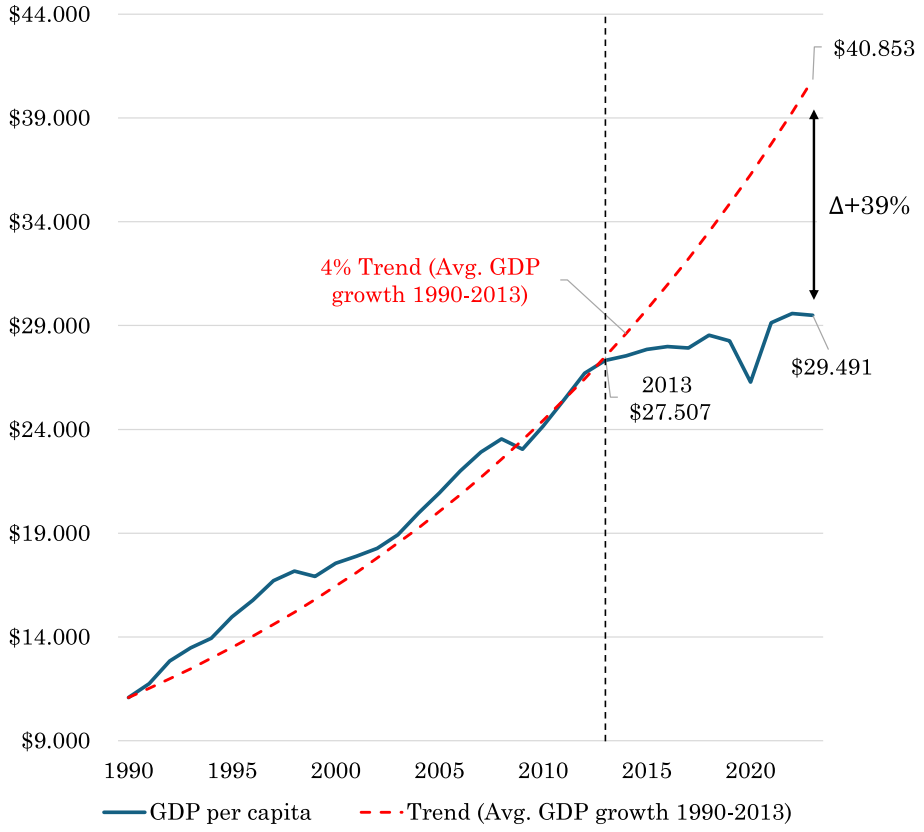

Fig. 2 Chile's real GDP per capita (PPP constant 2021 int. US$) (1990–2023). The vertical line marks 2013. The dotted line represents Chile's growth trend following the average GDP growth rate from 1990–2013. Authors' elaboration based on World Bank data

factors. These alternative hypotheses (internal versus external factors) spurred an intense debate in the region among economists and policy makers (Larrain et al. 2014; Bergoeing 2017; Cortázar 2019). For instance, Bergoeing (2017), after analyzing both hypotheses, concludes that since 2014 onwards, "the main factor for Chile's economic slowdown is local and endogenous: an uncertain environment that led to generally and persistently postponing investments" (ibid. 1). Yet, this Latin American debate has remained primarily focused on circumstantial evidence and descriptive statistics, which highlights the existing gap in the literature and our main contribution.

Overall, the descriptive evidence supports the idea that internal and political factors could be the main reason for Chile's slowdown, especially after ten consecutive years of stagnated growth (2014–2024). However, the unsettled question is precisely how much this "endogenous factor" (internal set of reforms) contributed to the sudden South American miracle's slowdown. Nevertheless, the debate in the region has remained primarily based on anecdotal evidence, thus unable to provide a statistically rigorous and empirically robust explanation of what happened to the Chilean economy during the last decade. To put this debate in perspective, consider Fig. 3, which shows Chile's GDP per capita relative to the World and other selected countries (1990–2019). The figure shows the sudden change in

trend that the Chilean economy suffered from 2014 onward relative to the rest of the world (right panel) and selected countries (left panel). These descriptive statistics provide *prima facie* evidence suggesting that Chile's slowdown is driven strongly by internal factors such as policy changes and a policy regime change which we will analyze in what follows.

The reason why the focus of attention resides in 2014 as a possible break in Chile's trend of economic performance is not only due to the stylized facts of the previous figures, but also due to its recent public policy changes. The fact that a potential structural break occurred in 2014 (see also Appendix) is consistent with the historical narrative that several critical policy and politically-related events occurred during that year, which could represent a *policy regime change* (Wilson 2000). In other words, it is plausible that the second period of President Bachelet supposed a nontrivial change in the kind of public policies the country had enacted compared to previous decades (Bergoeing 2017; Cortázar 2019; Edwards 2023). As suggested by Benedikter et al. (2016): "Bachelet vowed to enact a multi-dimensional change so far-reaching and interdisciplinary in scope and extension that she called it a coordinated array of 'policies that change cultures"'. Hence, "Bachelet promised to not only apply sectorial corrections, but to change the functional, institutional and constitutional basics of the nation to create a 'new culture"' (ibid.). We will briefly analyze this period, and the battery of reforms promoted, to shed light on the potential policy regime change.

In March 2014, Michelle Bachelet returned to the Chilean presidency for a second time, promising "a far-reaching reform program that vowed to initiate a 'new historical cycle' in the South American nation" (ibid. 2). When Bachelet obtained the Presidency in 2014, her centre-left coalition also arrived at power with solid support in Congress—gaining the majority of both houses of the legislature (Kinghorn 2016)—to implement an extensive battery of reforms and policy changes, that represented a "simultaneous multi-sectoral change and intertwined reforms" (Benedikter et al. 2016).

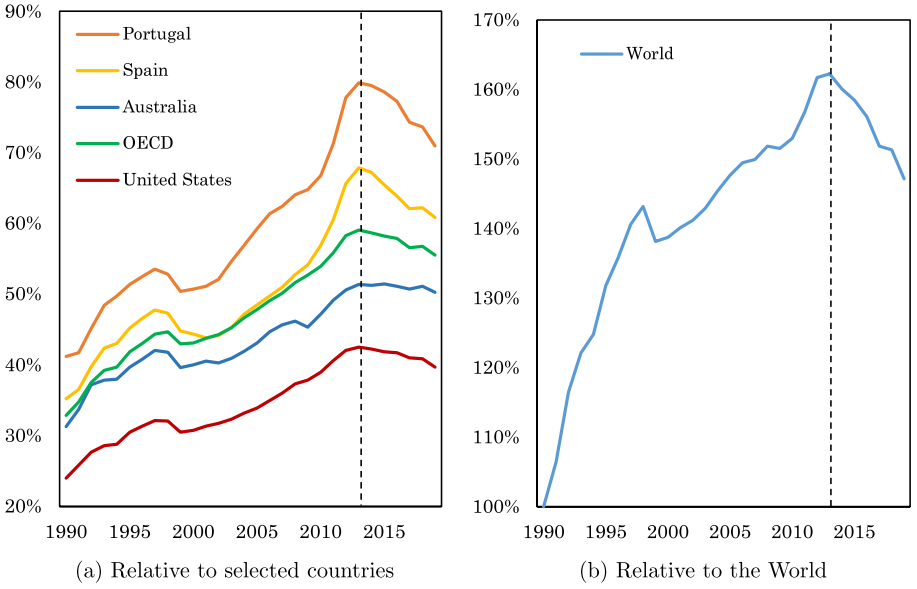

Fig. 3 Chile's GDP per capita PPP (constant 2017 international $) relative to selected countries and the World. The dotted vertical line marks 2014. Authors' elaboration based on World Bank data

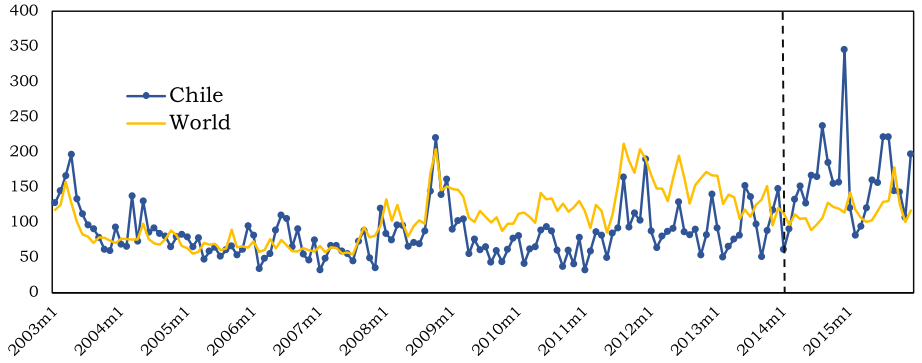

Fig. 4 Economic Uncertainty Index, Chile and the World. The dotted vertical line marks 2014. Authors' elaboration based on Cerda et al. 2016

This comprehensive set of internal reforms included six key issues: (i) a tax reform to increase corporate taxes (Kinghorn 2016); (ii) an educational reform to de-privatize and end for-profit entities, and to undo market-based policies in education (Guzmán-Concha 2017; iii) a political reform to change the electoral system (Gamboa and Morales 2016); (iv) a constitutional process to end the constitution established during the dictatorship (Contreras and Lovera 2021); (v) a labor market reform to strengthen the bargaining power of syndicates (González and Portugal 2018); and, finally, (vi) a pension reform to increase the role of the state in social security (Borzutzky 2019). They all aimed to be implemented in tandem in a short period and during the first years of her presidency (Benedikter et al. 2016).[4]

Due to the broad reach of these reforms, some political scientists have considered Bachelet's second government the most significant political change Chile has undertaken since the return to democracy (Benedikter et al. 2016; Garretón 2016).[5] In addition, and taken together, these are far from minor reforms to a country's policy and economic framework. All of these are not only intertwined reforms but also far from simple and economically neutral policy decisions. These policy changes combined decisions that could cause non-negligible investment uncertainty and economic volatility (Absher et al. 2020; Widmalm 2001). To illustrate this, Fig. 4 depicts that economic uncertainty in Chile started climbing rapidly during the early part of 2014, reaching levels not seen in decades (see also Claro and Sanhueza (2023)). Figure 4 also shows that 2014 was the first time in many years that Chilean local uncertainty surpassed the world uncertainty

[4] To specify the timing of these reforms during 2014: (i) the fiscal and tax reform was announced in March 2014 and later approved by the Chilean Congress in September 2014; (ii) the political reform that changed the electoral system was announced in April 2014 and later approved by Congress in November 2014; (iii) the educational reform was signed into law by Bachelet during May 2014; (4) the labor market reform was sent to Congress by President Bachelet in December 2014; (v) the pension reform failed to become a bill during 2014–2018; and, finally, (vi) the constitutional reform announced in October 2014 failed to generate an official document during Bachelet's presidency, but spearheaded a long-winded constitutional qualm that lasted almost a decade.

[5] As Garretón (2016) stated: concerning "Bachelet's second government … we are facing the first re-foundation project during the post-dictatorial democratic period that began in 1990 … its objective is to overcome the social, economic and political model that was inherited from the dictatorship".

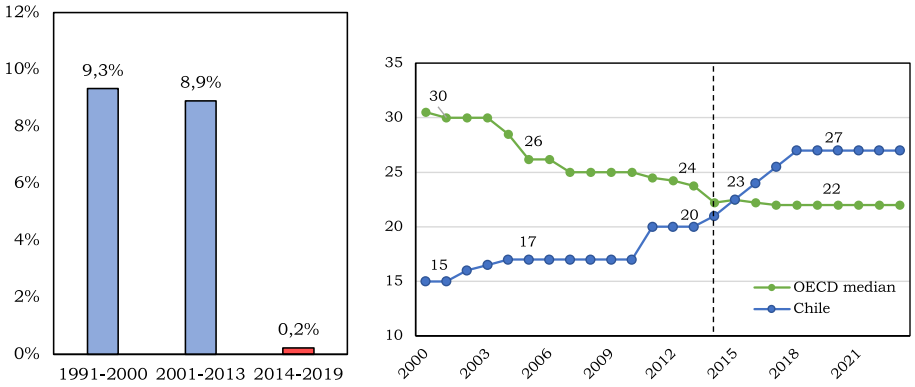

Fig. 5 Gross fixed capital formation, average annual growth rate for each period (left), and Statutory Corporate Income Tax Rates, Chile and OECD median (right). The dotted vertical line marks 2014. Authors' elaboration based on the Central Bank of Chile and OECD Corporate Tax Statistics

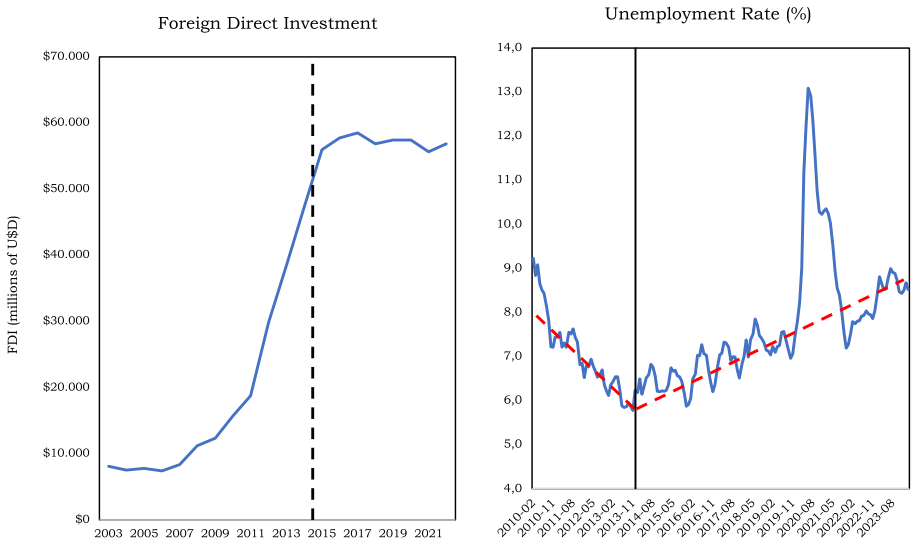

Fig. 6 Left: Foreign Direct Investment, vertical (dotted) line indicates approval of tax reform in 2014. Right: Unemployment Rate, quarterly moving average, vertical line marks 2014Q1, red (dotted) line marks trends. Authors' elaboration based on data from the Central Bank of Chile and the National Institute of Statistics

index. Additionally, as displayed in Fig. 5, yearly real investment growth rates plummeted, passing from an average of 9.3% during 1991–2000 (including the Asian crisis), and 8.9% during 2001–2013 (including the subprime crises), to a meager 0.2% during 2014–2019. Other relevant variables, such as foreign direct investment and unemployment, have also suffered relevant changes around that time, as shown in Fig. 6.

The fact that these reforms were either announced and/or implemented in a single year (see footnote 4) provides reasons to believe that Chile experienced a *policy framework shift*

or a policy regime change compared to the previous decades (Edwards 2023; Garretón 2016). This brief review is consistent with Wilson (2000)'s conception of a "policy regime change". Wilson defines such a change as "the abrupt episodes of substantial change [which] occurs with changes in the policy paradigm, alterations in patterns of power and shifts in organizational arrangements" (ibid. 247). According to Wilson, there are four factors determining a policy regime change: (i) Changes in power or the arrangement of power, (ii) Policy paradigm shifts, (iii) Organizational changes within government, and (iv) Changes in the policy itself (ibid. 258).

It is plausible that President Bachelet's second term (2014–2018) represented a potential "policy regime change" for Chile for three main reasons (see also Benedikter et al. (2016) and Garretón (2016)). First, her new centre-left coalition (New Majority) was indeed a significant change in power, both by succeeding the center-right government of Sebastián Piñera and by including, for the first time since Salvador Allende's government, the Communist Party of Chile (PCCh) as part of the left political coalition, as well as in the highest echelons of power (Benedikter et al. 2016).[6] Second, Bachelet's new coalition also had an explicit and strong normative view against the market-based Chilean economic model (Cortázar 2019; Garretón 2016; Paniagua 2021), which represented a new political project that explicitly *distanced itself* from the previous post-dictatorship and pro-market consensus (Durán 2019).[7] Thus, the new regime's normative and political rhetoric against the previous pro-market consensus represented a "paradigm shift" (Benedikter et al. 2016). Third, and finally, the all-encompassing set of reforms enacted indicate an evident change in the policy itself when compared against the pro-market consensus of the previous decades, particularly concerning the agreement that existed around electoral rules and the Constitution, as well as with the "economic rules" concerning the role of the private sector in the provision of public services and their tax structure (Edwards 2023; Guzmán-Concha 2017; Gamboa and Morales 2016).

Furthermore, as shown in Fig. 7, and from an institutional point of view, the Latin American Left-Leaning Populism Index for Chile showed a significant rise precisely in 2014 when compared to previous years, reaching its highest level for the country since the inception of this index, precisely during Bachelet's second government in 2017. This change, again, seems to support our claim that 2014 represents, from a political economy perspective, a structural shift in the nature of the policies and rhetoric that Chile experienced during our treatment year (both in terms of the normative rhetoric employed, and in terms of the explicit content of the policies implemented).

However, the concomitance of both internal and external shocks renders the analysis of the causes behind Chile's economic slowdown challenging, resulting in varied polarized interpretations and contrasting diagnoses. For instance, some economists have highlighted the impact of the 2014 Chilean tax reform, specifically the increase in the corporate tax rate from 20 to 27% (Fuentes and Vergara 2021; Larrain et al. 2014). This tax reform has been one of the most significant fiscal changes that Chile has experienced since the 1980s (De Gregorio 2014; Rivera 2017). The increase in the tax burden situated Chile with a

[6] In her first Cabinet Appointment in 2014, President Bachelet appointed, for the first time since the return to democracy and after four decades of being outside key political roles, a communist as part of the top Cabinet in government (Claudia Pascual, which acted as Minister Director of the National Service for Women, being the first communist in 41 years to be in the ministerial cabinet in the country).

[7] As President Bachelet recognized while still in office: "there were some vestiges of the neoliberal model that we have been putting an end to through the reforms" (La Tercera 2017).

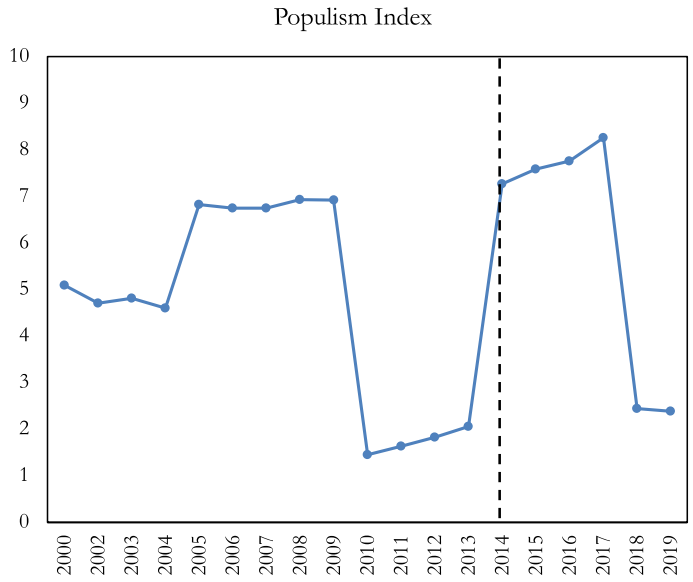

Fig. 7 The Latin American Left-Leaning Populism Index for Chile (2000–2019). The dotted vertical line marks 2014. Authors' elaboration based on The Latin America Left-Leaning Populism Index (2025)

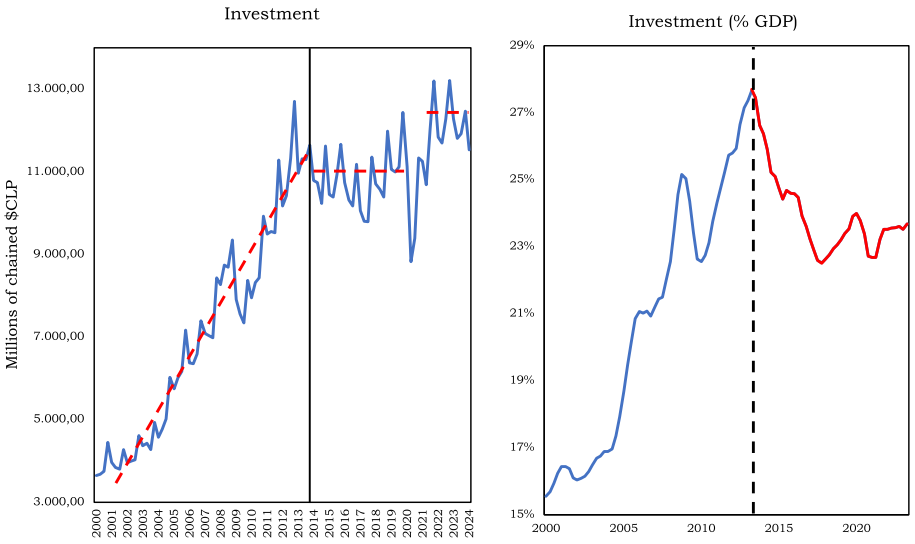

Fig. 8 Left: Investment (Gross Capital Formation) in levels (quarterly). Right: Investment as % of GDP, vertical lines indicate 2014, red (dotted) line trends. Authors' elaboration based on the Central Bank of Chile

corporate tax rate higher than the OECD average (Fuentes and Vergara 2021): while the corporate tax rate in Chile has gone up, in all the other OECD countries, on average, it has gone down, as illustrated in Fig. 5 (ibid. 71).

The reform changed the corporate tax burden and altered the incentives to reinvest, potentially affecting investments and capital accumulation (Marfán et al. 2023; Fuentes and Vergara 2021; Larrain et al. 2014). A similar image is conveyed by the average annual growth rate for the gross fixed capital formation and the level of investment for that period (see Fig. 8).

3 Creating a synthetic control for Chile

We will now explore the hypothesis that Chile experienced a sudden slowdown mainly due to internal factors based on the potential policy regime change explored in Sect. 2. Addressing this question presents a significant challenge due to the lack of reasonable counterfactuals (Absher et al. 2020; Grier and Maynard 2016). An already established body of literature has recently provided the tools for such comparisons through the synthetic control method (SCM). The SCM is a methodological approach suitable for causal inference in case studies with one treated unit and limited macroeconomic data (Abadie 2021). SCM combines aspects of the matching and difference-in-difference techniques to facilitate counterfactual comparisons. Recently, SCM has been employed in a variety of fields, such as political science (Abadie et al. 2015), political economy (Absher et al. 2020; Grier and Maynard 2016), and development (Billmeier and Nannicini 2013; Cachanosky et al. 2025; Spruk 2019).

Methodologically, SCM aims to construct a counterfactual for Chile during the post-treatment period by optimally weighting untreated countries in the donor pool. Due to the diversity across Latin American countries, no single country can accurately replicate Chile's socioeconomic indicators. Thus, SCM systematically selects a combination of countries that best represents Chile's economy during the pre-treatment phase. Using pre-treatment data, the algorithm[8] constructs a "Synthetic Chile" based on the main outcome variable Y_t, which is real GDP per capita, and additional predictors Z_t. These predictors include key determinants of the outcome variable, potentially incorporating Y_t itself (see Table 2).[9]

3.1 Assembling the data

Following Abadie et al. (2015), Absher et al. (2020), and most recently, Abadie (2021) and Escalante (2022), we choose a pool of donor countries that share, to a smaller or greater degree, similar conditions to the pre-treatment period for the independent variable. Such conditions include culture, history, geography, education, language, structural economic similarities, and institutional framework. Table 1 provides information on the country groups and their respective weights in the synthetic control estimation.

We use annual country-level panel data for 1990–2019, before the Covid-19 exogenous shock and the internal shock that occurred during the 2019 Chilean social unrest (*estallido social*). The selection of donor countries (untreated observations) consists of most Latin American countries, capturing similarities in cultural background, language, geography,

[8] Data and code replicating the results in this article can be found in https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/8JRMCA, in the Harvard Dataverse, V1.

[9] Readers interested in the statistical properties and the mathematical construction of the SCM model can consult: Abadie (2021) and Gilchrist et al. (2023).

Table 1 Donor units and their respective weights in the synthetic estimation for Chile

Donor Units	Weights
Argentina	0.000
Australia	**0.048**
Bolivia	0.000
Canada	0.000
China	**0.260**
Colombia	0.000
Costa Rica	**0.514**
Dominican Republic	0.000
Ecuador	0.000
Guatemala	0.000
Honduras	0.000
Mexico	0.000
Nicaragua	0.000
Panama	**0.005**
Peru	0.000
Philippines	0.000
South Africa	0.000
Spain	0.000
United States	0.000
Uruguay	**0.170**
RMSPE (Model fit pre-intervention)	448

RMSPE provides information on the root mean square prediction error for assessing the pre–intervention fit of the model

Table 2 Chile's Indicator fits GDP per capita

	Actual Chile	Synthetic Chile	Sample Mean	Source
GDP per capita	9200.43	9245.28	11979.81	World Bank
Population Growth	1.20	1.30	1.36	
Life Expectancy	76.64	76.04	73.03	
Adolescent fertility	59.99	56.69	64.44	
Crude birth rate	16.60	17.45	20.28	
Gross capital formation	25.46	25.30	22.78	
Government consumption	0.15	0.16	0.15	Penn World Table
Trade Openness	62.59	63.42	59.16	Our World in Data
Mean years of schooling	9.30	7.34	8.04	Human Development Index

Table shows the values of indicator variables and the average pre-treatment outcome variable for actual Chile, synthetic Chile and the total sample average. Real GDP per capita constant 2015 US$

history, and other local aspects, countries such as Spain, given it's past as colonizer of most Latin American countries, and some crucial trading partners and commodity exporters such as China, Australia, and South Africa. This procedure also matches the significant copper exporter nature or 'commodity-based' feature of the Chilean economy, akin to what Grier and Maynard (2016) have done to construct a synthetic counterfactual for

Venezuela. This is important since one of the main channels through which this slowdown could have passed-through, comes from the end of the commodities' super-cycle. We quantitatively show how we accurately capture the above in Sect. 3.2 and it's relevance for the overall analysis. Therefore, we consider 20 donor countries for a 24-years pre-treatment period, providing a large window of pre-intervention in line with Abadie (2021)'s recommendations.

The SCM also needs to match the control variables to build the synthetic Chile. Indicator variables should be known to be good predictors of the outcome variable, in this case, real GDP per capita. We chose the variables that best fulfill the abovementioned requirements in line with the literature (Abadie et al. 2015; Absher et al. 2020; Grier and Maynard 2016). Table 2 displays the variable selection, sources, and descriptive statistics for the actual Chile, synthetic Chile, and the pool of donors' total average. Notably, the synthetic Chile provides a much better overall comparison and fit for actual Chile than the pool's average, especially where it matters the most, GDP per capita. Synthetic Chile is very similar to actual Chile regarding pre-2014 per capita GDP, population growth, life expectancy, adolescent fertility, birth rate, gross capital formation, government consumption, trade openness, and mean years of schooling.

To ensure a correct causal interpretation, some assumptions must hold and several robustness test must be provided. First, within the pool of donors, no country should have had a similar intervention during the period in which the estimation is taking place. In Sect. 2, we provided evidence showing how unique, all-encompassing, and immediate Chile's internal reforms and policy changes were. Following this analysis, no other country within the pool of donors had a similar 'policy regime shift' intervention during this period as broad and significant as Chile. When we compare the wide-ranging policy shift of Chile–ranging from fiscal and tax reforms to the core of the political system, among others–against the recent policy changes of our donor countries, it is safe to establish that only Chile (during the period under consideration) had such an extensive and sudden change in the policy framework. Nevertheless, to ensure this *in a quantitative framework*, we also provide an exhaustive robustness test (Jackknife) to address (and detect) any possible donor-treatment contamination (see Appendix). Such robustness checks support our baseline findings.

Second, synthetic Chile's GDP per capita should be able to replicate the exogenous shocks in the same way Chile would've experienced them, especially on the commodities front. Fortunately, to test this, we have two recent natural experiments–the global financial crisis (2008) and the boom during the commodity super-cycle–that allow us to test the robustness of our synthetic counterfactual. As displayed in Sect. 3.2, synthetic Chile accurately captures Chile's actual behavior facing those external shocks during 2008 and during the commodity super-cycle period, strengthening the robustness of our estimation,[10]

Third and finally, in our SCM estimations we provide also a comprehensive battery of robustness tests (see Appendix), including in-time placebo tests, alternative GDP measures,

[10] As further robustness of this point, in 2014 Chile's reliance on mining exports accounted for 50.1% of its total exports (WTO 2014). Similarly, from Table 1 the donor countries that possess positive weights and, therefore, were used to construct Synthetic Chile, exhibit *similar commodity exposures* during the same period, ensuring that Synthetic Chile faces external shocks in a comparable manner by being similarly exposed to commodity exports and commodity price fluctuations. For instance, and from our donor countries, the commodity exports as a share of total exports are 85% for Australia, 36% for Costa Rica, 53% for Panama, 77% for Uruguay, and 8% for China, yielding a 'commodity exposure' average of 51.8% and a (donor) weighted 'commodity exposure' average of 38% (UNCTAD 2016, 2019).

in-country placebo tests, cross-validation, and an extensive leave-one-out permutation test (Jackknife). The results remain unchanged with only minor deviations, providing sufficient support for the robustness of our benchmark result and a causal interpretation of them.

3.2 Results and estimations on per-capita income

Figure 9 displays actual and synthetic Chile's real GDP per capita trajectory from 1990 to 2019. Synthetic Chile provides excellent pre-treatment tracking of actual Chile during the 24-years pre-treatment period, especially in the years closer to the intervention. The synthetic estimation and 'fit' are noteworthy accomplishments of our model given Chile's explosive and atypical growth path compared to the rest of the region during the 'boom period.' Now, it is important to correctly capture the significant copper exporter nature of the Chilean economy (see also footnote 10). An exogenous way to test this statement is by examining the commodity super-cycle period (approximately 2005–2013).

If synthetic Chile had flaws in capturing the commodity-driven nature of Chile's economy, real Chile would have exhibited *a higher* GDP per capita than the (incorrectly constructed) Synthetic Chile due to the significant exogenous shock from the commodities boom. This is not the case as seen in our SCM model from Fig. 9. Notably, our synthetic Chile demonstrates an excellent pre-treatment fit, particularly during that period, without any significant deviation. Likewise, substantially larger (negative) shocks than the commodity super-cycle, such as the global financial crisis in 2008, are also accurately captured by synthetic Chile. The correct estimation of these two significant (both positive and negative) exogenous economic events during the pre-treatment period suggest that the constructed synthetic accurately captures the global external shocks, during the entire pre-treatment period, as real Chile experienced them. Moreover, our model has the virtue of not containing the endogenous policy reforms of 2014, which is one of the virtues of SCM in order to correctly estimate the impact of internal public policy and political choices of countries (Abadie et al. 2015; Absher et al. 2020).

Now, concerning the treatment effect, our estimate of the impact of the internal policy reforms on Chile's real GDP per capita is given by the difference between the actual Chile (blue line) and the Synthetic one (red dotted line) in Fig. 10. Our estimated model, which by construction controls for external shock and isolates the internal component, indicates

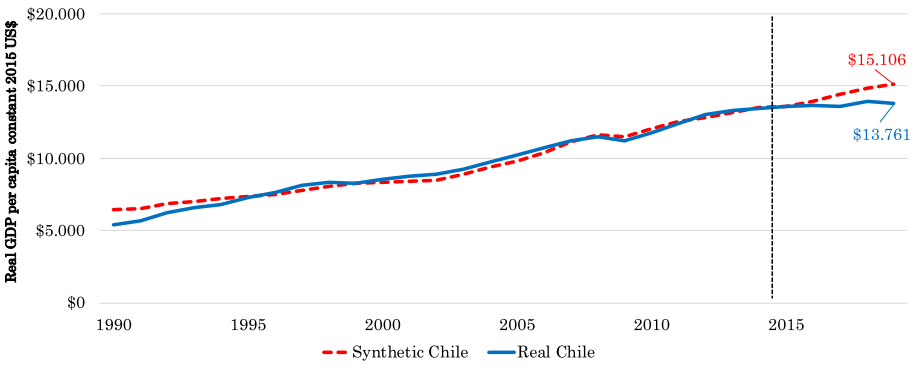

Fig. 9 Per-capita income. Note: The solid blue line represents real GDP per capita (constant 2015 US$) in Chile, 1990–2019; the red (dotted) line represents the synthetic control. The vertical black dotted line indicates the end of the pre-treatment years (1990–2013)

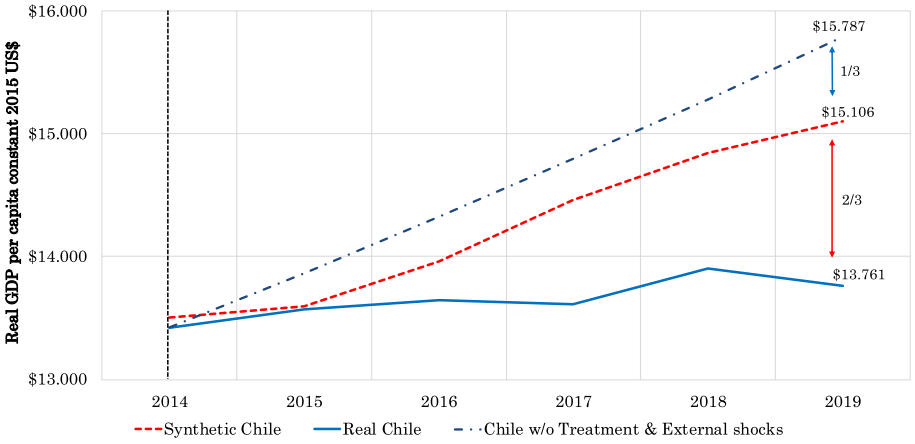

Fig. 10 Per-capita income: External and internal factors decomposition. Note: The dark blue (dotted) line represents the Chile's Trend GDP (2014). The solid blue line represents real GDP per capita (constant 2015 US$) in Chile, 1990–2019; the red (dotted) line represents the trend of the synthetic control. The vertical black dotted line indicates the end of the pre-treatment years

that after five years of the intervention experienced in 2014 (i.e., by 2019), actual Chile presents a real GDP per capita of $13.761, while the synthetic version predicts a counterfactual of $15.106. The estimated difference is substantial, suggesting that Chile lost nearly $1.345 in GDP per capita in only five years due to the intervention.[11] In other words, Chile's real per capita income should have been practically 10% higher *without* the policy regime change. Results suggest that the relevant policy regime shift was, in fact, detrimental to Chile's overall level of wealth per capita and economic growth.

Moreover, it would be helpful to track the evolution of three time series: (i) actual Chile, (ii) Chile without internal shocks, and (iii) Chile without internal and external shocks. By construction, the difference between (ii) and (i) captures the isolated impact of internal shocks (what we called previously the "treatment effect"), while the gap between (iii) and (ii) would reflect the impact of external shocks alone. Figure 10 presents these three growth series. To disentangle the contributions of "endogenous" versus "exogenous" determinants to this slowdown, we must calculate Chile's GDP per capita growth in the absence of external shocks during the post-treatment period. A widely recognized and frequently used benchmark for this purpose is the "trend GDP" (known in Chile as *PIB tendencial*) as defined in Albagli and Naudon (2015). Trend GDP is provided by the Chilean Independent Expert's Commission on Growth (DIPRES), which, by construction, estimates the "productive capacity in the absence of shocks" (Albagli and Naudon 2015).

[11] There are two main reasons why it is sensible to stop our SCM growth estimations in 2019, rather than extend them throughout the entire decade (2014–2024): first, and according to the methodological recommendations and best practices of SCM (see Abadie et al. 2015; Abadie 2021; Grier and Maynard 2016), it is generally advisable not to extend the analysis of synthetic estimations beyond five years after an intervention. Second, and perhaps more importantly, Chile, by the end of 2019 and throughout 2020, experienced a massive social unrest, and thereafter in 2020–2023 a deeply polarized and convoluted Constitutional qualm that, taken together, generated a relevant endogenous shock *posterior* to the one examined in this paper which could severely contaminate our growth estimations after 2019.

By computing Chile's estimated GDP trend in 2014, Fig. 10 reveals that at least two-thirds of Chile's recent economic slowdown can be attributed to internal factors, with at most one-third stemming from external causes. It is important to note that our measurement of the relative weight of internal over external factors is conservative, since there is an ongoing debate in the literature suggesting that the Chilean potential/trend GDP for 2014 may have been overoptimistic.[12] Consequently, the proportion of each channel (external and internal) estimated here could represent a conservative estimate with a potential downward bias, serving as a "floor" result that underscores the dominant role of internal political reforms in Chile's overall economic performance during this last decade.

Finally, a caveat is worth emphasizing: a limitation of our analysis is that, due to the lack of empirical micro-data and due to the *simultaneous implementation* of multiple policy changes in 2014, we cannot isolate and identify the impact of each individual reform. However, as shown in our literature review in Sect. 2, this paper is the first to employ modern empirical techniques to quantitatively distinguish between internal and external factors contributing to this slowdown, which underscores the novelty of our research. While we are able to identify the importance of the set of internal policy changes and quantify their effect as a group, we are unable to disaggregate the impact of each specific reform. Nonetheless, our analysis and methodological approach represent a crucial step towards a better empirical understanding of growth reversals in Latin America and their relationship with policy regime changes (see also Aiyar et al. 2013; Easterly 1992; Rodrik 2014).

3.3 Cross-validation

To strengthen the robustness of our findings, we employ a synthetic control approach with machine learning by building on the work of Abadie (2021) and, most recently, Araujo (2024)'s guidelines. Our complementary approach employs machine learning

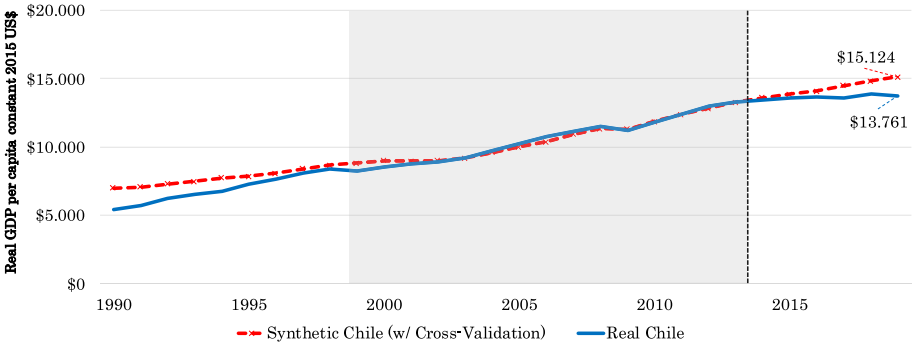

Fig. 11 Per-capita income. Note: The solid blue line represents real GDP per capita (constant 2015 US$) in Chile, 1990–2019; the red dotted line (x marker) represents the cross-validated synthetic control. The vertical black dotted line indicates the end of the pre-treatment years (1990–2013)

[12] In fact, the estimates of both potential and trend GDP for Chile have been systematically revised downward in the years following 2014, thereby limiting, by construction, the weight attributed to external factors in our estimates. See Central Bank of Chile (2014) and Albagli and Naudon (2015).

cross-validation techniques to evaluate the efficacy and robustness of the synthetic control estimation, detailed in Fig. 11. Adhering to standard cross-validation methodological procedures, we divide the dataset into subsets or folds, creating multiple training and validation phases. We set a training period from 1990 to 1998, leading to a validation phase from 1999 to 2014. In the Appendix (section 3) we present Table 3 with the optimal cross-validated weights compared to our benchmark estimations. Figure 11 illustrates the results of the synthetic control method utilizing the optimally weighted cross-validation intervals for the described training and validation periods.

From Fig. 11, it is possible to notice that during the validation period (the gray area from 1999–2014), the fitting of our model is superior to our prior SCM model without cross-validation, meaning that the training period successfully provided a better RMSPE outcome. Moreover, these additional results are consistent with those depicted in Figs. 9 and 10—that is, results remain roughly unchanged, with at least two-thirds of the growth slowdown attributable to internal factors. The above cross-validation technique suggests that our methodology is being correctly employed and that we are, in fact, accurately capturing the treatment/intervention effect, that is, the impact of the set of internal reforms enacted in 2014. All our results are significant under a 90% confidence interval for most recent years, as depicted in the next section.

3.4 Robustness checks

3.4.1 P-Values

To evaluate the statistical significance of our results, in the spirit of Abadie (2021) and Abadie et al. (2015), we measure how "atypical" is the Chilean synthetic divergence from the rest of the donor placebo tests. Figure 12 displays the difference between the treatment effect in Chile, with the average treatment effect from the placebos. The center values in the bars display the statistical significance, which indicates that for the last years of post-treatment period, the difference is substantially large under a 90%

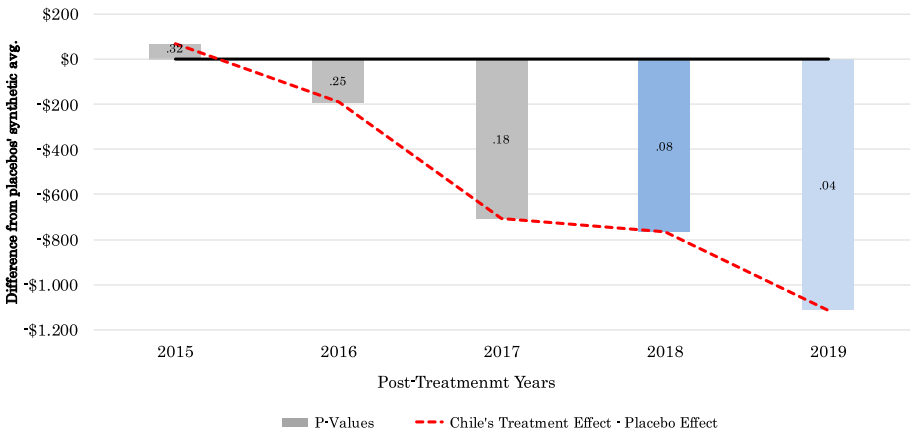

Fig. 12 Effects of the treatment and p-values on real GDP per capita. Bars show the difference between actual Chile and the placebos' synthetic average, measuring the treatment effect for each year. Center values represent the statistical significance level. The red (dotted) line displays the treatment effect from the results in Fig. 9

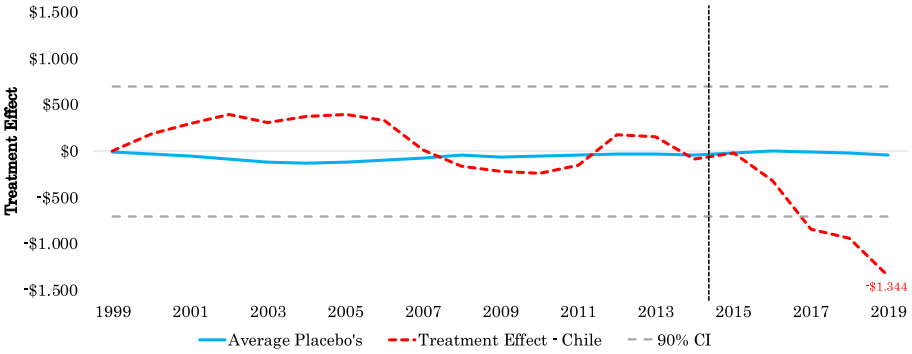

Fig. 13 Effects of the treatment and placebo's average under 90% confidence interval. The red (dotted) line displays the treatment effect from the results in Fig. 9

confidence interval (CI). Complementary, we also display the evolution of the treatment placebos' averages with Chile's treatment effect in Fig. 13.

Our results indicate that the methodology is accurately capturing the average dynamics of the placebos, with a correct treatment effect near zero for the pre-treatment period while also capturing the post-treatment effect in synthetic Chile with a robust statistical significance. This means that we can safely reject the null hypothesis of no "atypical" divergence, reinforcing the finding that the difference between actual Chile and its synthetic average is statistically significant and that results are robust along this dimension.[13]

3.4.2 In-time placebo tests

The in-time placebo test follows the methodological recommendations of Abadie (2021) and Absher et al. (2020), which consists in estimating the SCM with alternative intervention specifications to check whether an "in-time placebo effect" exists. The above ensures that the model can actually capture and distinguish between false (placebo) interventions

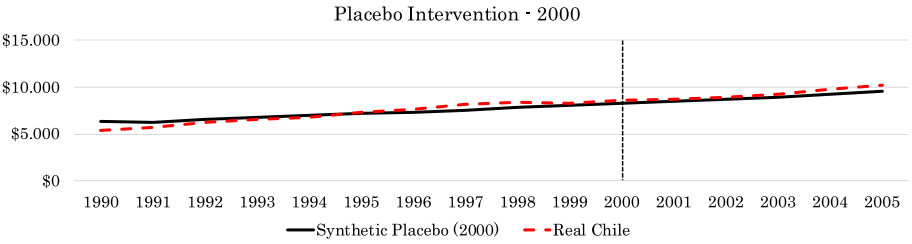

Fig. 14 In-time placebo test. The solid black line represents Chile's real GDP per capita (constant 2015 US$) from 1990 to 2005; the red (dotted) line represents the synthetic control. The vertical black dotted line indicates the new 'treatment' (placebo) year set in 2000

[13] SCM estimations with small donor pool sizes tend to have very sensitive p-values. For instance, and in our case, if our donor sample has 20 countries, taking one country out of the estimation could potentially lead to obtain non-statistical significant results at the 5 percent mark. In order to deal with this concern, in the Appendix we expand the donor pool to 30 countries, and we address concerns regarding the sample robustness of our inference.

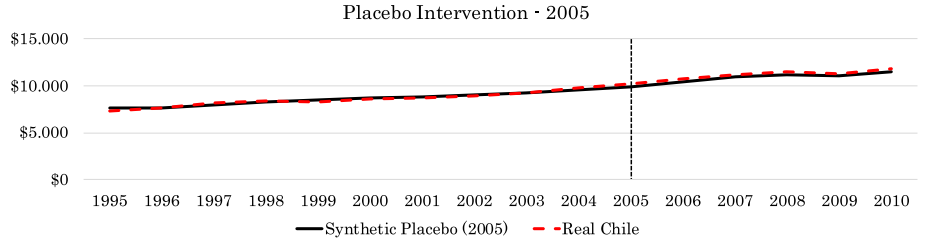

Fig. 15 In-time placebo test. The solid black line represents Chile's real GDP per capita (constant 2015 US$) from 1995 to 2010; the red (dotted) line represents the synthetic control. The vertical black dotted line indicates the new 'treatment' (placebo) year set in 2005

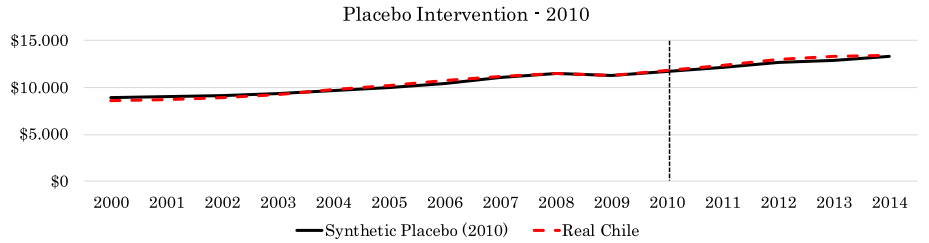

Fig. 16 In-time placebo test. The solid black line represents Chile's real GDP per capita (constant 2015 US$) from 2000 to 2014; the red (dotted) line represents the synthetic control. The vertical black dotted line indicates the new 'treatment' (placebo) year set in 2010

and real ones. In short, if we estimate the model with an intervention year other than 2014, we should not have any significant tracking difference in the pre and post-treatment periods. Figures 14, 15, and 16 display this robustness test for several placebo intervention periods (2000, 2005, and 2010). Our results indicate that the synthetic estimation is correctly identifying the false (placebo) interventions, which gives additional support to the robustness of our benchmark estimation, which contains a significant treatment effect from 2014 onward.

Finally, one of the main indicators we are interested in is the GDP growth component. Taking the results from the benchmark synthetic estimation (Fig. 9), we compute the synthetic GDP growth rates that Chile should have experienced without the intervention (the internal reforms). As depicted in Fig. 17, Chile should have had a yearly average GDP growth rate of approximately 3.8% (calculated from our counterfactual), in contrast to the effective 2.0% average that Chile did in fact experienced. The above, when adjusting for population growth, becomes approximately a 3.0% yearly per capita growth. Once more, considering the Chilean GDP trend as benchmark (4.5%), determinants of growth rate deceleration can be decomposed into approximately 30% external causes (0.7%) and 70% internal (1.8%), which aligns with previous findings. Although our results identify the overall effect of the internal causes component as a group, one of our limitations is that we cannot do the same to determine *which* policy change in specific, within the overall set of changes reviewed in Sect. 2.1, has a higher (or lower) contribution to Chile's slowdown. The above is a recurrent problem faced in the literature due to the lack of granular data (Abadie 2021; Abadie et al. 2015).

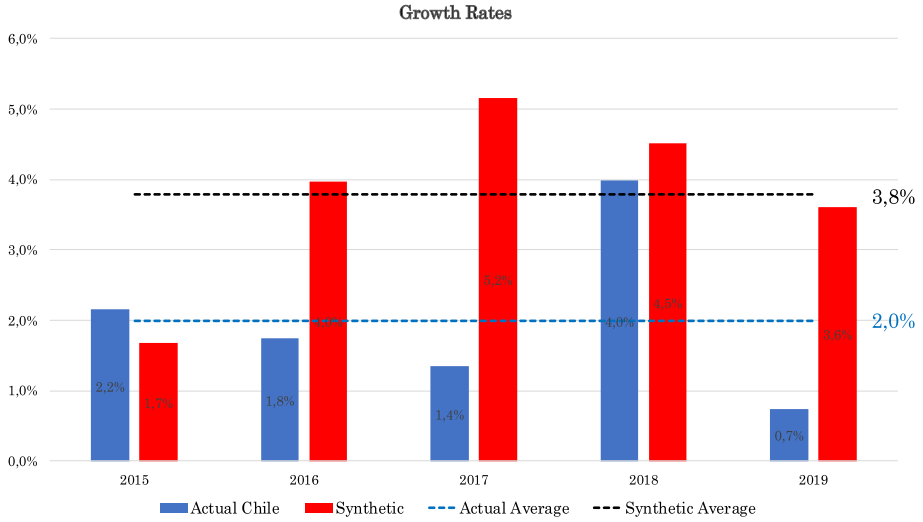

Fig. 17 GDP growth rates. Blue bars represent real Chile GDP growth rates for 2015–2019. The red bars represent synthetic Chile GDP growth rates for the same period. The blue (dotted) line represents the real Chile's average GDP growth rate for 2015–2019. The black (dotted) line represents the synthetic Chile's average GDP growth rate for the same period

4 Concluding remarks

We have studied a pressing problem that has affected a wide range of developing economies: Why can countries that appear to grow rapidly suddenly suffer from growth reversals? (Aiyar et al. 2013; Eichengreen et al. 2014). Using a synthetic control approach, we have focused on Chile's recent economic and political events. Our analysis suggests that Chile's sudden slowdown and its recent "lost decade" are primarily related to endogenous factors most likely attributed to significant political rhetoric and economic changes that altered its policy framework in 2014. Results indicate that at least two-thirds of Chile's slowdown can be attributed to internal causes and only one-third to external ones. This policy shift cost Chile almost 10% of its real GDP per capita in five years. We find that Chile's real GDP per capita rose slower (i.e., stagnated) after the 2014 policy shift than it would have without such a policy change, as shown by the performance of the synthetic control. This translated into Chile being $1.345 (per capita) poorer than predicted by the synthetic counterfactual. Our results are consistent with the literature that establishes that external shocks explain only a small fraction of the poor economic performance of developing countries, suggesting that internal and political factors are the primary source of subpar outcomes (Chumacero 2019; Raddatz 2007).

Our paper suggests that sudden policy regime changes could create potential wealth penalties (Grier and Maynard 2016; Spruk 2019; Bjørnskov 2005). Cases such as Chile highlight how political (anti-market) rhetoric and sudden policy shifts could affect the trend in economic growth of developing countries (Absher et al. 2020). Our findings are consistent both with the political economy of tax shocks and corporate taxes (Mertens and Ravn 2013; Widmalm 2001; van der Wielen 2020; Gemmell et al. 2011), as well as with the role that ideology and unexpected policy changes might play in affecting development (Bjørnskov 2005; Easterly 1992; Rodrik 2014). Based on these insights and the approach

suggested in this work, our paper is relevant for delineating a new research agenda concerning the empirical political economy of Latin America's institutional and political regime changes and their associated economic failures. Hence, the analysis of this paper could be extended to other countries in the region through a meta-analysis. For instance, future research could analyze multiple institutional breakdowns and policy regime changes in the region through a larger multi-SCM analysis, following our suggested approach combined with the multi-SCM method proposed by Cachanosky et al. (2025), and Billmeier and Nannicini (2013).

Appendix

Accounting for Chile's structural break

Concerning Chile's structural break, one relevant aspect to analyze is its convergence dynamics. The literature indicates that when countries double their GDP per capita, their growth rates typically decline by 2–3% (Barro 1991). Given Chile's historically rapid growth, some may argue that lower growth rates compared to previous periods are a natural outcome. Thus, the pertinent question is determining how much Chile's growth deviated adjusting for this convergence factor.

Figure 18 shows the growth dynamics of Chile's GDP per capita during the period 1952–2019. The vertical axis represents Chile's smoothed annual per capita growth rate,[14] while the horizontal axis displays the level of GDP per capita over the same period. From

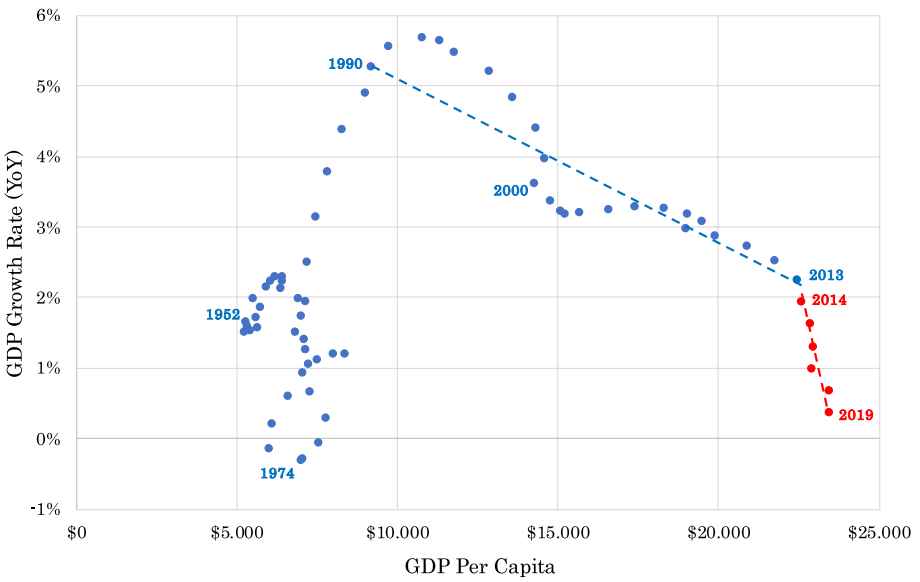

Fig. 18 Relationship between per capita growth rate and per capita GDP for Chile during 1952–2019. Source: Own elaboration based on Penn World Tables 10.01., real GDP per capita national accounts based in constant dollars (2017US$)

[14] The smoothed growth rate is calculated using a Hodrick-Prescott filter with a parameter $\lambda = 100$.

the figure, we can see a structural break in 2014. Moreover, to compare Chile's performance with the world, we estimate a convergence path that serves as a reference for the dynamics observed in Fig. 18. To construct this empirical convergence path, we select countries whose GDP per capita in the most recent available year (2019) exceeds the sample average of approximately $20.000 (based on 138 countries). For these selected countries, we compile data on growth rates and GDP per capita spanning the period from 1950 to 2019. We created a scatter plot of all country-year observations, with smoothed growth rates on the vertical axis and GDP per capita levels on the horizontal axis. Based on this sample, we estimate a quantile regression fit. In Fig. 19, the red line represents the quantile regression estimation, while the dashed lines indicate the interquartile range (25–75%). The black line corresponds to the relationship between Chile's GDP per capita and GDP growth rates during the period 1952–2019 (same as in Fig. 18) .

Figure 19 illustrates that Chile has significantly deviated from its convergence path. From the late 1980s through the early 1990s until 2013, Chile's GDP per capita growth closely followed that of high-income countries. However, once Chile's GDP per capita reached approximately $22.500 in 2014, the country began to diverge rapidly from the central convergence line. This divergence culminated in an abrupt decline, placing Chile outside the interquartile range by 2017 (still during Bachelet's second government), with its per capita growth rate nearing 0% in 2019. In contrast, our empirical estimate—represented by the red line—suggests that a country with a per capita income of $22.500 should be growing at an annual rate of approximately 3.0% if it wants to converge to higher income levels.

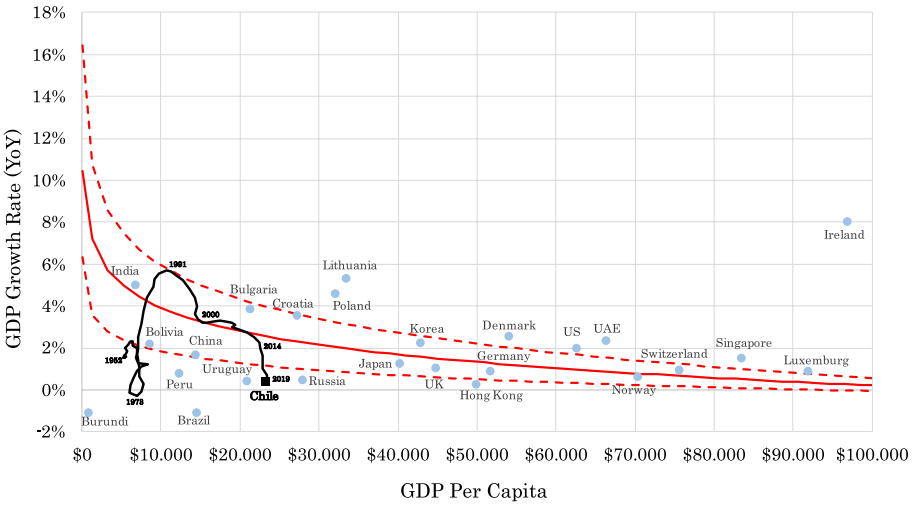

Fig. 19 Relationship between per capita growth rate and per capita GDP for selected countries. Note: The solid black line illustrates Chile's convergence dynamics from 1952 to 2019. The black square indicates the last available year for Chile, 2019. Points show the relationship between per capita growth rate and per capita GDP in 2019 for selected countries. The solid red line represents a quantile regression estimation of global convergence for countries above the sample mean. The dashed red lines indicate interquartile ranges (25–75%). Source: Own elaboration based on Penn World Tables 10.01., real GDP per capita national accounts based in constant dollars (2017US$)

Battery of robustness tests

To further evaluate the credibility of our benchmark results, we conduct several robustness tests suggested by the literature (see Absher et al. 2020; Abadie 2021; Escalante 2022; Grier and Maynard 2016; Spruk 2019), such as in-time placebo tests and *p*-values significance (see Sect. 3.4), and multiple leave-one-out (Jackknife) permutation tests, multiple in-country or in-space placebo tests, estimating the SCM while changing the composition-size of our donor's pool to an alternative group and, finally, testing alternative GDP measures.[15]

Leave-one-out permutation tests

This robustness test consists of dropping the country donors with the highest weights in the model to see if the benchmark results of the previous sections still hold. In this case, we go even further than the standard literature and provide a set of multiple SCM estimations by dropping, one by one, all the countries that had positive weights in the original estimation model. Figure 20 shows the results of all the SCM estimations by leaving one of the positive weighted countries out each time. Results indicate that, independently of the country that was dropped for any particular estimation performed, the magnitude and pattern of real GDP per-capita outcomes are similar and close to the benchmark estimation.

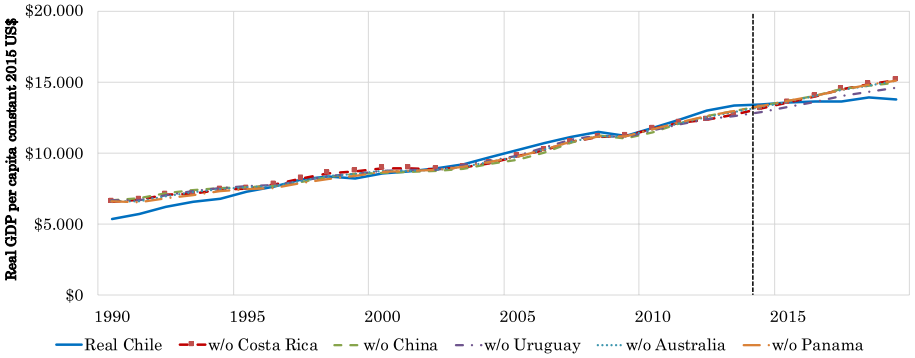

Fig. 20 Jackknife multiple permutation tests (leave-one-out). The solid blue line plots the actual GDP per capita for Chile. All the other lines represent the different SCM estimations without that specific country on the sample

[15] Due to space constraints, we have decided to focus this appendix only on the most relevant robustness tests that complement the ones seen in the Sect. 3.4) while leaving other tests—such as changing the composition size of our donor's pool to an alternative group and testing alternative GDP measures–to our online supplementary material available in the replication package: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/8JRMCA.

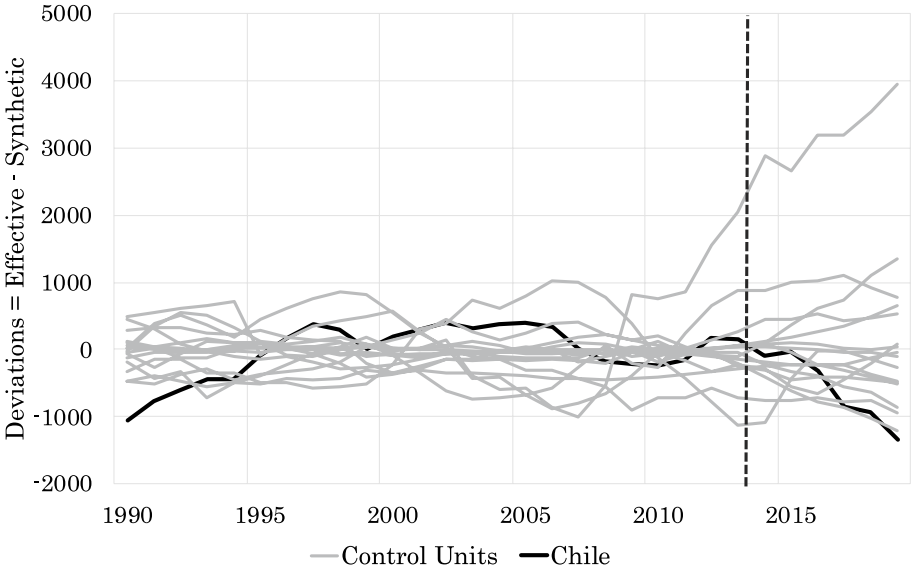

Fig. 21 Real GDP per capita (constant 2015 US$) placebo tests, restricted countries. Note: The bold line represents the difference between Chile's observed income per capita, 1990–2019, and the synthetic control. Analogously, the gray lines represent the same difference for different donors, representing different placebo tests

In-country placebo tests and RMSPE country ratios

The goal of the in-country placebo robustness test is to verify if our results are, in fact, due to the internal set of reforms that took place in 2014 and not merely driven by a lack of predictive power. Figure 21 shows the results of the in-country placebo test, where we estimate the SCM for all the countries in the pool of donors. The results suggest that, after the 2014 intervention period, Chile is one of the countries that present the most significant break and divergence among the pool. Our synthetic Chile has a noticeable change or 'break' after introducing the treatment, which is significant and persists over the entire post-treatment period, unlike most other control countries for the post-treatment years.

Figure 21 also suggests that Chile does not have a consistent real per capita GDP growth after the reforms in 2014, reinforcing the idea that our benchmark results reflect the impact of the Chilean internal change in the reforms that took place in the intervention year. This also provides further statistical evidence supporting the central hypothesis of our study concerning the fact that the policy changes enacted in 2014 represent a policy regime shift that led to a structural break in the Chilean economy (see Sect. 2.1).

Cross validation results

Table 3 presents the optimized weights of the Cross-Validation estimation (in Sect. 3.3). Figure 11 in the main text shows that the cross-validation estimation provides an excellent validation period fit, providing a better RMSPE than the synthetic benchmark. The above indicates that the cross-validation was successful in the learning/training phase, resulting in an improved estimation.

Table 3 Cross-validation results. The first column indicates the benchmark weights from the estimation in Fig. 9. The second column indicates the optimized weights of the Cross-Validation optimization (in Fig. 11)

	Benchmark synthetic	Cross-validated synthetic
Argentina	0.000	0.000
Australia	**0.048**	0.000
Bolivia	0.000	0.000
Brazil	0.000	0.000
Canada	0.000	0.000
China	**0.260**	**0.160**
Colombia	0.000	0.000
Costa Rica	**0.514**	**0.247**
Dominican Republic	0.000	0.000
Ecuador	0.000	0.000
Guatemala	0.000	0.000
Honduras	0.000	0.000
Mexico	0.000	0.000
Nicaragua	0.000	0.000
Panama	**0.005**	**0.124**
Peru	0.000	0.000
Philippines	0.000	0.000
Portugal	0.000	0.000
South Africa	0.000	0.000
Spain	0.000	**0.095**
United States	0.000	**0.241**
Uruguay	**0.170**	**0.129**
RMSPE (Model fit pre-intervention)	448	259

RMSPE provides information on the root mean square prediction error for assessing the pre–intervention fit of the model

Expanded donor pool

As an additional robustness check, we expand the donor pool to 30 countries (plus Chile). Table 4 reports the estimated donor weights under this extended specification, and Fig. 22 plots the resulting synthetic Chile trajectory. The overall pattern remains virtually unchanged, thereby reinforcing the validity of our primary conclusions. Furthermore, we perform a standardized RMSPE p-value test to corroborate the significance of the treatment effect compared to the positive weighted donor placebos' in our extended pool. Our results indicate a p-value of 0.12, also reinforcing the idea of an atypical deviation after the treatment, although less significant than the findings in Sect. 3.4.1.

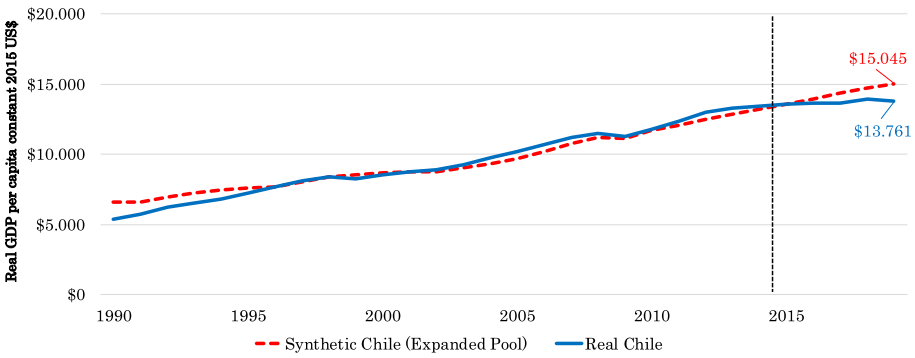

Fig. 22 Per-capita income. Note: The solid blue line represents real GDP per capita (constant 2015 US$) in Chile, 1990–2019; the red (dotted) line represents the synthetic control (estimated with the expanded donor pool). The vertical black dotted line indicates the end of the pre-treatment years (1990–2013)

Table 4 Donor units and their respective weights in the synthetic estimation for chile

Donor units	Weights
Argentina	0.000
Australia	**0.002**
Austria	0.000
Bolivia	0.000
Brazil	0.000
Canada	0.000
China	**0.269**
Colombia	0.000
Costa Rica	**0.547**
Denmark	0.000
Dominican Republic	0.000
Ecuador	0.000
El Salvador	0.000
France	0.000
Germany	0.000
Guatemala	0.000
Honduras	0.000
Kuwait	0.000
Mexico	0.000
Nicaragua	0.000
Panama	0.000
Peru	0.000
Philippines	0.000
Portugal	0.000
Saudi Arabia	0.000
South Africa	0.000
Spain	**0.003**
Sweden	0.000
United States	**0.047**
Uruguay	**0.131**
RMSPE (Model fit pre-intervention)	476

RMSPE provides information on the root mean square prediction error for assessing the pre–intervention fit of the model

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Declarations

Conflict of interest The authors declare no competing interests.

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