Natural, Social and Financial Capitals*

Oğuzhan Karakaş, Annalisa Tonetto, and Alessa Widmaier

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Abstract: This paper analyses how financial development affects the loss of biodiversity. In our analysis, we built upon Guiso, Sapienza and Zingales (AER-2004), who find that social capital (instrumented by electoral participation and blood donation) improves the financial development, through enhancement of trust among the economic actors. We document a negative relationship between social capital and natural capital, within the context of Italy. Instrumenting financial development with different measures of social capital, we find support for the Environmental Kuznets Curve (EKC) hypothesis: there is an inverted U-shaped relationship between the level of biodiversity degradation and the economic growth. Economic development initially causes deterioration in the biodiversity, which then eases and improves as the economic development increases. Our findings are robust to various measures of biodiversity, namely Mean Species Abundance, Biodiversity Intactness Index, Deviation from Potential Natural Vegetation, and a measure obtained by applying Principal Component Analysis to the above-mentioned biodiversity measures.

JEL classification: G10, H4, O16, Q2, Q57, Z13.

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* **Oğuzhan Karakaş:** Centre for Endowment Asset Management, Cambridge Judge Business School, University of Cambridge, Trumpington Street, Cambridge CB2 1AG, UK. Phone: +44 (0)1223 766449. E-mail: o.karakas@jbs.cam.ac.uk. | **Annalisa Tonetto:** SKEMA Business School, Avenue Willy Brandt, 59777 Euralille, France. E-mail: annalisa.tonetto@skema.edu. | **Alessa Widmaier:** Faculty of Economics, University of Cambridge, Sidgwick Avenue, Cambridge CB3 9DD, UK. E-mail amw217@cam.ac.uk. We are thankful for helpful feedback from Luigi Guiso and the members of the Cambridge Endowment for Research in Finance (CERF), and the Department of Economics at University of Cambridge. Karakaş gratefully acknowledges the financial support of the CERF.

1. Introduction

The Dasgupta Review (2021) argues that we are amidst a global crisis, where natural systems are on the verge of a human-made breakdown, and biodiversity must be put at the core of the economics to address this problem. Within this context, it is important to understand how the financial development/capital affects biodiversity richness and abundance of natural resources, which are central to economic prosperity.

The Environmental Kuznets Curve (EKC) hypothesises an inverted U-shaped relationship between the level of environmental degradation and the economic growth (see Figure 1): EKC would suggest that economic development initially causes deterioration in the environment (through pre-industrial economies, such as agriculture), which then eases (through industrial economies) and improves (through post-industrial economies, such as service sector) as the economic development improves.[1] Analysing the effect of economic development on natural capital is not straightforward, due to measurement issues and other endogeneity concerns such as reverse causality.

[~ Insert Figure 1 about here ~]

This paper analyse how financial development affects the loss of biodiversity, within the context of Italy. We built upon Guiso, Sapienza and Zingales (2004), who find that social capital (instrumented by electoral participation and blood donation) improves the financial development, through enhancement of trust among the economic actors.

In our analysis, we find support for the EKC hypothesis. First, we establish that social capital increases GDP per capita. Next, we find that GDP per capita has an inverted U-shaped relationship with the loss of biodiversity (measured by four different measures of biodiversity: Mean Species Abundance, Biodiversity Intactness Index, Deviation from Potential Natural Vegetation and a measure obtained by applying Principal Component Analysis to the previously mentioned biodiversity measures). The analysis is a cross section that consider the most recent year available for each biodiversity measures (2020 or 2022) and controls for GDP

[1] For a detailed literature review on EKC see: Han S. and Jun H. (2023), Zhong K. (2022), Pincheira R. and Zuniga F. (2021), Hussain A., and Dey, S. (2021), Renzhi N. and Baek J. (2020) and Katircioğlu S. and Taşpinar N. (2017).

per capita, GDP per capita squared, Education, Education squared, Fertility, Gender, Crime, Age, Civil Unions and includes Industry Fixed Effects. One of the major contributions of this paper is that we use satellite and geospatial data to estimate the biodiversity metrics. We obtain the exposures to each industry (Agriculture, Manufacturing, Services) for every province from firm level data located within the province and we also show that the impacts on biodiversity differ depending on the taxonomy group considered, for example: amphibians, birds, mammals, plants, and reptiles.

We use different IV specifications to confirm the EKC hypothesis. In the first specification, we instrument GDP per capita and GDP per capita squared with measures of social capital and social capital squared. In the second one, we compute the fitted value of the regression of x over the instruments and use its square as instrument. This approach is aligned to the one used in the paper Coles J., Lemmon M. and Meschke, J (2012). Another IV specification we use includes as additional instruments, the higher powers of the other control variables.

We finally show the important finding that our biodiversity measures capture additional information compared to CO2 emissions (correlation is 0.24 with Mean Species Abundance, 0.27 with Biodiversity Intactness Index, 0.22 with Deviation from Potential Natural Vegetation and 0.26 with PCA Natural). We therefore confirm the EKC hypotheses using CO2 instead of biodiversity measures, and we finally add CO2 as control in our regressions. The coefficients of interest remain statistically significant also after including CO2 as control variable, suggesting that our proposed biodiversity metrics capture different and additional information to standard emission measures.

This paper contributes to the nascent literature of biodiversity and finance. This recent field of research has been discussed by (Karolyi et al. 2022) proposing a research agenda on biodiversity finance. In addition to that, the fact that investors have concerns about the effect of businesses on biodiversity has been reinforced at the presidential address of the AFA 2023 annual meeting (Starks, 2023).

In response to these calls, finance scholars have primarily focused on studying whether corporate biodiversity footprint is priced in the cross-section of stock returns, on whether biodiversity projects are financed by pure private capital or blended financing structures, on

the effects of biodiversity events on corporate bonds' spreads and finally have been proposing news-based measure of aggregate biodiversity risk.

Evidence suggests that corporate boards with a higher proportion of female directors are more sensitive to the concerns of institutional pressures and respond to those concerns by increasing corporate biodiversity disclosures (Haque et al. 2020). It has also been shown that blended finance is the more prevalent form of financing for larger-scale biodiversity projects, with lower expected returns and risk. On the other hand, projects with higher expected returns tend to be financed by pure private capital, but they are usually smaller, as their expected biodiversity impact (Flammer et al. 2023). Considering research on stock returns, some studies find that there is no evidence that firm's corporate biodiversity footprint explains the cross-section of stock returns, on average (Garel et al. 2023), while other studies, suggest that the risk premium for biodiversity over the past decade is close to zero, and when discriminating between premia based on realized returns and expected returns, find that with the latter, premia have been significantly negative in the recent years (Coqueret et al. 2023).

Additional research examines how firms' financing conditions, measured by CDS spreads, are influenced by the impact of the environment on firms and the impact of firms on the environment focusing on biodiversity, water risks and pollution prevention. Results suggest that the risks associated with water and biodiversity impacting a firm are perceived to be long-term issues, as evidenced by significantly negative effects on CDS slopes (Hoepner et al. 2023). Moreover, companies in the sectors that have the greatest impact on biodiversity have seen their corporate bond spreads widen in the wake of acute biodiversity events in the 2019-2022 period, on average (Cherief et al. 2020), and this is the first evidence of the market effect of acute biodiversity events on Australian and Brazilian corporate bonds' spreads.

Finally, a news-based measure of aggregate biodiversity risk has been developed, and there is evidence that biodiversity risks already affect equity prices. In fact, returns of portfolios that are sorted on these measures of biodiversity risk exposure covary positively with innovations in aggregate biodiversity risk (Giglio et al. 2023).

With this paper we provide evidence of a negative relationship between social capital and natural capital, we find support for the EKC hypothesis, and propose innovative measures of biodiversity applied to the context of Italy.

2. Data Summary

In this section we introduce and explain the differences between the biodiversity measures: Mean Species Abundance (MSA), Biodiversity Intactness Index (BII), and deviation from potential natural vegetation (DEV_PNV). We also introduce a description of how these measures are constructed. All these metrics are suitable headline indicators for species abundance.

Mean species abundance (MSA) expresses the mean abundance of original species in disturbed conditions relative to their abundance in undisturbed habitat, as an indicator of the degree to which an ecosystem is intact.[2] The indicator ranges from 100 percent (intact ecosystem where all the species remain) to 0 percent (destroyed ecosystem with no original species left). It is function of six anthropogenic pressures: land use, infrastructure, habitat fragmentation, human encroachment, atmospheric nitrogen deposition and climate change. Six major taxonomic groups are covered: mammals, birds, reptiles, amphibians, terrestrial invertebrates, and vascular plants.

Another measure used in this paper is the Biodiversity Intactness Index (BII) which summarises the change in ecological communities in response to human pressures. BII is an estimated percentage of the original number of species that remain and their abundance in any given area, despite human impacts. The BII is averaged across areas (countries, regions or global) to give the remaining biodiversity across that area, and it is computed using data from ecological studies conducted around the world.[3] This data includes more than 54,000 species (birds, mammals, plants, fungi, and insects). A BII of 100% indicates a pristine ecosystem while 0% is an entirely depleted ecosystem. If the BII is 90% or more, the area has enough biodiversity to be a resilient and functioning ecosystem. Under 90%, biodiversity loss means ecosystems may function less well and less reliably. If the BII is 30% or less, the area's biodiversity has been depleted and the ecosystem could be at risk of collapse. The BII is derived from combining two models: the first model represents how human activity has influenced the total

[2] The methodology of the MSA assessment is based on GLOBIO Version 3.5 (Alkemade et al., 2009) developed by the Netherlands Environmental Assessment Agency (PBL), which makes use of extensive terrestrial biodiversity databases, for example the Integrated Model to Assess the Global Environment, to establish quantitative pressure-impact relationships.

[3] It uses PREDICTS (Projecting Responses of Ecological Diversity In Changing Terrestrial Systems) to establish quantitative pressure-impact relationships.

abundance of species in any one area. The second model analyses how similar each site's ecological community is to the near-undisturbed sites (this is known as the compositional similarity and includes what original species are present and what species are dominant).

Area of habitat (AOH) indicates the share of an area that is inhabited by the species (it is the average calculated across each of the 1070 species in the data source). For example, an Area of habitat of 0.4 means that 40% of the land area considered, falls within that species habitat. It ranges between 0 and 1, where 1 indicates that all the species have habitats that stretch across 100% of the selected area and 0 means that none of the species are present anywhere within the area. Equation (1.1) reports the formula for Area of habitat (AOH):

$$\text{AOH} = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{habitat\ area}{provincial\ area}\right) \tag{1.1}$$

where $i = 1, \ldots, N$ indicates individual species, and all variables are assumed to be observed at the same time t.

The deviation from potential natural vegetation (DEV_PNV) is the percentage share of the original AOH measure that is still intact in the year in question. A DEV_PNV of 90 in year 2020 means that the AOH is 10% lower in 2020 compared to the potential natural vegetation without human interference (see equation 1.2 where t indicates time t). The taxonomy groups included to compute DEV_PNV are: amphibians, mammals, plants and reptiles.

$$DEV\ PNV_t = \left(\frac{AOH_t}{AOH_{PNV}}\right) * 100 \tag{1.2}$$

Values of DEV_PNV higher than 100 must be interpreted as an increase in biodiversity compared potential natural vegetation, on the opposite, vales lower than 100 must be interpreted as a decrease in biodiversity compared to potential natural vegetation. Another version of this metric uses original landcover rather than potential natural vegetation.

These biodiversity indicators are intended to complement each other to provide a more comprehensive view of pressures and impacts on biodiversity. In fact, there are differences in

the taxonomy groups included, and in the pressure-impact relationships models used (GLOBIO[4] vs PREDICTS).

We then apply a Principal Component Analysis (PCA) to the following three biodiversity measures: Mean Species Abundance (MSA), Biodiversity Intactness Index (BII), and deviation from potential natural vegetation (DEV_PNV). The correlation among these measures is 0.81 (MSA and BII), 0.56 (DEV_PNV and MSA), and 0.47 (DEV_PNV and BII), suggesting that these biodiversity indicators capture different aspects of the degradation or conservation of nature.

We use QGVIS software to retrieve spatial data (vector and raster) for: (i) Biodiversity Intactness Index; (ii) GDP (purchasing power parity); and (iii) Regional, province and municipality outlines for Italy (administrative unit levels 2, 3 and 4). Figure 2 illustrates an example of data retrieve using QGVIS.

[~ Insert Figure 2 about here ~]

The weights attributed to each of the 3 metrics to obtain the additional Biodiversity metric (called "PCA Natural") are the following:

$$PCA\ Natural = \mathbf{38\%} * MSA + \mathbf{36\%} * BII + \mathbf{26\%} * DEV_PNV$$

We include Industry Fixed Effects in the regressions and we assign each of all the Italian provinces to one of the three groups of industries: agriculture, production, and services, depending on the highest industry representation of the private and public firms for each province.

To provide a first evidence of the variability among provinces of the main variables of interest for natural and social capital (biodiversity, blood donation and referendum participation) we provide a map of the values for each province in our analysis. Figure 3 presents the percentages

[4] Alkemade, R., van Oorschot, M., Miles, L., Nellemann, C., Bakkenes, M., & ten Brink, B. 2009. GLOBIO3: A Framework to Investigate Options for Reducing Global Terrestrial Biodiversity Loss. Ecosystems, 12(3): 374–390.

of participation in the referendum in 2020. The top three provinces with higher participation rates are respectively: Aosta (73%), Trento (72%), and Bolzano (70%). On the other hand, the three provinces with lower participation rates are: Palermo (33%), Trapani (34%) and Oristano (34%). The average participation rate is 53%.

[~ Insert Figure 3 about here ~]

Figure 4 presents the percentages of Mean Species Abundance (MSA) in 2020. The top three provinces with higher MSA are: Aosta (89.40%), Sondrio (87.80%), and Verbano Cusio Ossola (81.90%). On the other hand, the three provinces with lower MSA are: Cremona (9.90%), Padova (11.30%), and Milano (11.40%). The average MSA is 34.7%.

[~ Insert Figure 4 about here ~]

Figure 5 presents the values of Blood donation (scaled by population) in 2020. The top three provinces with higher Blood donation are: Ragusa (91), Lecco (73), and Mantova (68). On the other hand, the three provinces with lower Blood donation are: Imperia (0.7), Trieste (0.7), and Caltanissetta (1.3). The average Blood donation is 32.

[~ Insert Figure 5 about here ~]

Table 1, Panel A, reports the summary statistics of social and natural capital variables. The mean of MSA in 2020 was 34.7, with a min of 9.9 and max of 89.4, indicating that this measure of abundance of species is relatively low and the ecosystem is not intact, on average across the Italian territory. One specific feature of the biodiversity measures is that they are very stable across the years observed showing little time series variation. These features are even stronger than what has been historically presented for the most commonly used ESG metrics.

[~ Insert Table 1 about here ~]

The proxies of social capital used in this paper are blood donation and referendum participation. We collect the amount of blood donated in 2020 and divide it by the population of that province/region, and we also collect the percentage of people voting at Referendums from 1974 to 2022. We report that the mean blood donation on population is 31, on a range from 0 to 91.

Participation rates to referendum show some time series variation, and we report a mean participation rate across all the years in analysis of about 53%.

Table 1, Panel B, reports the summary statistics of economic, demographic, and other variables. Financial variables include income, GDP, and percentage of non-performing loans (NPL). Demographic variables include population, population density, years of education, fertility rate, gender, civil unions, crime, age, life expectancy, people in assistance institutes, and percentage of users on the target population of the social service. Geographic variables include geographic size (sqm), and four macro areas (North East, North West, Center, South). We also include a measure of judicial inefficiency.

[~ Insert Table 2 about here ~]

Table 2 reports that proxies of social capital are negatively correlated with the proxies of natural capital.

3. Empirical Analysis

The specification of the model for our empirical analysis is the following, where *i* is the Italian province. We run cross-sectional regressions, where the dependent variable is either Mean Species Abundance, or another measure of biodiversity as proxy for natural capital. In a first step, the variable of interest Social Capital_{i} is either blood donation, or referendum participation. The controls we consider are: geographic size (sqm), years of education, years of education squared, fertility rate, gender, civil unions, crime, age, GDP per capita.

$$\boldsymbol{Natural\ Capital}_{\boldsymbol{i}} = \boldsymbol{\alpha_0} + \boldsymbol{\beta_1}\,\boldsymbol{Social\ Capital}_{\boldsymbol{i}} + \sum_{\boldsymbol{k=1}}^{\boldsymbol{K}} \boldsymbol{\vartheta_k}\,\boldsymbol{controls}_{\boldsymbol{k,i}} + \boldsymbol{\varepsilon_i}$$

Table 3 reports the results of OLS regressions estimates considering *Mean Species Abundance* as dependent variable, and different measures of social capital: blood donation, three different measures of referendum participation from 1974 to 2022, and number of non-profit organizations scaled by geography. We document a statistically significant negative relationship between social capital and natural capital for all the proxies of social capital except number of non-profit organizations.

[~ Insert Table 3 about here ~]

Tables 4, 5 and 6 repeat the analysis in Table 3, but with different biodiversity measures as proxy of social capital. In particular, Table 4 uses Biodiversity Intactness Index, Table 5 uses deviation from potential natural vegetation, and Table 6 uses PCA Natural as alternative biodiversity measures. The negative relation between social capital and natural capital is also further corroborated with these alternative biodiversity measures.

[~ Insert Tables 4, 5, and 6 about here ~]

We next find evidence of the EKC hypothesis finding an inverted U-shaped relationship between the level of environmental degradation and the economic growth. We measure economic growth with GDP per capita and environmental degradation by multiplying with a negative coefficient, our biodiversity measures. We also find support of the EKC hypothesis by using CO2 emissions. To do so, we specify model with fixed effect and instrumental variables.

We propose three different specifications of social capital as instrument for GDP per capita and GDP per capita squared and the results reported in this paper are robust across these different specifications. We initially use Referendum, Referendum squared, Blood and Blood squared as instruments for GDP per capita and GDP per capita squared. In the second specification, we compute x_hat as the fitted value of the regression of x over the instruments, we then compute the square of that and use both of them as instruments. In this specification, there is a manual first step in which we specify the structure[5] of the relationship between GDP

[5] *** Specification z - z_squared - 1/z

gen oneoverAVGREF_ALL = 1/AVGREF_ALL

reg GDPpercapita AVGREF_ALL AVGREF_ALL2 oneoverAVGREF_ALL EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind

predict xhat_C

gen xhat_C_2 = xhat_C^2

ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind (GDPpercapita GDPpercapita2 = AVGREF_ALL xhat_C_2), robust

per capita and social capital measures. The third, and last IV specification, includes as additional instruments the higher powers of the other control variables[6].

Table 7 reports the results of the first IV specification, and Table 8 reports the second IV specification, showing that the coefficient estimate on the GDP per capita is positive and statistically significant, and the coefficient estimate on the squared GDP per capita term is negative and statistically significant. These results are consistent across all the biodiversity metrics analysed in this paper. Table 9 reports the results of the third IV specification, suggesting similar conclusions.

[~ Insert Tables 7, 8 and 9 about here ~]

Since there is a potential concern that our biodiversity measure could potentially capture the same information as CO2 emissions, we then include CO2 as additional control variable. As it can be seen in Table 10, our results are still largely valid also after the inclusion of CO2 emissions.

[~ Insert Table 10 about here ~]

Finally, Figure 6 shows the inverse U-shaped relationship between the biodiversity measures and GDP per capita where a fitted polynomial curve is included.

[~ Insert Figure 6 about here ~]

4. The Relationship Between Social Capital and Financial Inclusion

We examine the relationship between social capital (proxied by blood donation rates and attendance to referendum) and various dimensions of financial inclusion. The analysis focuses on four dependent variables: *(i)* Financial Inclusion Index, a composite weighted average of banking density, credit accessibility, and savings mobilization, *(ii)* banking density, measured

[6] ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind (GDPpercapita GDPpercapita2 = AVGREF_ALL AVGREF_ALL2 Blood_new Blood_new2 EDU3 EDU4 GENDER2 AGE2), robust

as bank branches per 10,000 residents, *(iii)* credit accessibility, measured as loans per capita, and *(iv)* savings mobilization, measured as deposits per capita.

Social capital, conceptualized as the networks of relationships among people in a society that enable it to function effectively, has been theoretically linked to financial development through several mechanisms. Higher social capital typically correlates with greater trust in communities, which can reduce transaction costs in financial dealings and encourage formal financial participation. Moreover, communities with stronger social bonds often exhibit more efficient information sharing networks, potentially reducing information asymmetries in credit markets. Finally, in high social capital environments, informal enforcement mechanisms may complement formal contracts, potentially expanding credit access beyond what formal institutions alone could support.

To study the relationship between social capital and financial inclusion, we don't have access to the data Bank of Italy Survey of Household Income and Wealth (SHIW), as in used Guiso, Sapienza and Zingales (AER-2004), but our source is Bank of Italy, annual statistics on payment systems by province. The variable that is closer to one used in Guiso, Sapienza and Zingales (AER-2004) is credit accessibility. They find that social capital increases the probability of using checks, is associated with better access to credit and has a positive effect on the proportion of financial wealth invested in stock. On the other hand, it has a negative effect on the proportion of wealth a household invests in cash and is associated with a lower likelihood to receive loans from friends or relatives.

The regression results using referendum attendance as proxy for Social Capital reveal a strong positive and statistically significant relationship between referendum attendance and the Financial Inclusion Index (coefficient = 35.995, $p < 0.05$). This finding provides substantially stronger support for the hypothesis that social capital enhances financial inclusion compared to the blood donation. The magnitude of the effect is considerable, suggesting that higher civic engagement, as measured by referendum participation, is meaningfully associated with greater overall financial inclusion. This result reinforces theoretical arguments that the civic dimensions of social capital may be particularly important for financial development.

For banking density, Social Capital (proxied by blood donation) has a positive but marginally significant effect on Banking Density (coefficient = 8.156, $p < 0.1$) while referendum attendance shows a positive but statistically insignificant relationship (coefficient = 3,215.61,

$p > 0.1$). While the direction is consistent with the blood donation measure, the lack of statistical significance differs from the previous model where blood donations showed a marginally significant relationship with banking density. This suggests that different dimensions of social capital may operate through distinct mechanisms regarding the physical presence of financial institutions.

Referendum attendance shows a strong positive and statistically significant relationship with credit accessibility (coefficient = 42,291.480, $p < 0.05$). This result is aligned with previous findings from Guiso, Sapienza and Zingales (AER-2004). For savings mobilization, both proxies of Social Capital show a positive but statistically insignificant relationship, suggesting that social capital's effect on saving behaviour may be less direct or consistent than its effect on credit markets. While social capital shows some positive association with financial inclusion in our regressions, economic development (GDP per capita) appears to be the dominant driver of financial inclusion across all measures.

Concluding, blood donations showed the strongest relationship with banking density, referendum attendance shows its strongest relationship with credit accessibility, suggesting that blood donations may better capture aspects of social capital related to institutional presence and trust in formal organizations, while referendum attendance may better reflect civic engagement dimensions that facilitate credit relationships and financial transactions. Both proxies show consistently positive relationships across all financial inclusion measures, strengthening the overall conclusion that social capital generally supports financial development, regardless of how it is measured.

Tables 11 to 14 report IV regressions for different proxies of biodiversity, using four different measures of financial development as dependent variable: financial inclusion index, banking density, savings mobility, credit accessibility. This is a two-stage estimation procedure where the first stage uses instrumental variables to obtain adjusted predictions of financial development (addressing potential endogeneity with the instrument blood donation), and the second stage uses these predicted values as a regressor in a specification explaining biodiversity, effectively implementing a control function approach to handle endogeneity concerns in the relationship between financial inclusion and the outcome variable.

Table 11 shows that financial inclusion has a consistently negative and highly significant relationship with biodiversity (MSA20). Across all four specifications, the predicted financial

inclusion variables show strong negative coefficients with p-values < 0.01, suggesting that higher financial development is associated with lower biodiversity scores.

[~ Insert Table 11 about here ~]

The results presented in Table 12 provide important complementary evidence to the MSA20 findings, using a different biodiversity measure (BII) as the dependent variable. Financial inclusion consistently shows negative relationships with biodiversity intactness across all measures, reinforcing the pattern observed in the MSA20 results.

[~ Insert Table 12 about here ~]

Table 13 shows that financial inclusion consistently increases development pressure on natural areas across all measures, with all coefficients being negative and highly significant ($p < 0.01$). This aligns with the previous biodiversity results but measures environmental impact from a development/land-use pressure perspective.

[~ Insert Table 13 about here ~]

Finally, Table 14 shows that financial inclusion has consistently negative and highly significant relationships with the composite environmental score across all measures (all $p < 0.01$). This reinforces the pattern observed across individual environmental indicators but now with a composite measure that likely captures multiple dimensions of environmental quality simultaneously.

[~ Insert Table 14 about here ~]

We find negative relationships across four different environmental measures (three individual indices plus a composite measure) providing exceptionally strong evidence of the financial inclusion-environment trade-off. These results suggest a concerning trade-off between financial development and environmental conservation. The consistent negative relationship across different financial inclusion measures implies this is not driven by a single aspect of financial development but rather represents a broader pattern. This could reflect increased economic activity, resource extraction, or development pressures that accompany financial

inclusion expansion, potentially at the expense of biodiversity conservation. This comprehensive evidence across multiple environmental measures strongly supports the need for integrated policy approaches that consider environmental impacts when designing financial inclusion strategies.

4.1 Testing for non-linear relationships in financial development

Having established the role of financial development as a transmission channel for the relationship between economic development and biodiversity loss, we now examine whether financial development itself exhibits a non-linear relationship with environmental outcomes. Following the methodology employed in our Environmental Kuznets Curve analysis, we test for the existence of a "Financial Kuznets Curve", that is an inverted U-shaped relationship between financial development and biodiversity loss.

The theoretical motivation for this investigation stems from the dual nature of financial development's environmental impact. In early stages of financial market development, increased access to credit may facilitate resource-intensive economic activities and environmental degradation. However, as financial markets mature, they may increasingly channel capital toward more sustainable and environmentally-friendly investments, potentially leading to environmental improvements at higher levels of financial development.

We employ instrumental variables estimation to address the potential endogeneity of financial development measures, using the same rigorous econometric approach as our GDP per capita analysis. Multiple specifications are presented to ensure robustness, including alternative instrument sets and different functional forms. The results provide insights into whether the relationship between financial development and environmental outcomes follows a similar pattern to the traditional Environmental Kuznets Curve.

Table 15 shows that the linear term for financial development provides consistently positive and statistically significant effects across all four biodiversity loss measures, indicating that financial development is associated with increased biodiversity loss, suggesting that expanded access to financial services may facilitate environmentally harmful economic activities. However, the quadratic term is not statistically significant in any specification, with coefficients close to zero, suggesting that there is no evidence of an inverted U-shaped Financial Kuznets Curve in our sample. Unlike the traditional Environmental Kuznets Curve

for income, financial development does not appear to reach a turning point where further development begins to benefit biodiversity. These findings suggest that financial development, at least within the range observed in our sample, consistently contributes to biodiversity loss without the offsetting benefits seen at higher income levels.

[~ Insert Table 15 about here ~]

Table 16 provides the results using an alternative specification that shows stronger evidence for a Financial Kuznets Curve relationship. The linear term remains positive and statistically significant across all biodiversity measures, with stronger significance levels than the previous specification. This confirms that initial financial development is consistently associated with increased biodiversity loss. Importantly, the quadratic term now shows statistically significant negative coefficients for BII_NEG, providing evidence of an inverted U-shaped relationship for this biodiversity measure. While the quadratic terms for other measures remain insignificant, the negative signs suggest a potential turning point that may become significant with larger samples or different specifications.

This specification provides more compelling evidence that financial development follows an Environmental Kuznets Curve pattern for at least some biodiversity measures.

[~ Insert Table 16 about here ~]

Table 17 presents the strongest and most consistent evidence for financial development's impact on biodiversity loss, with several notable improvements over the previous specifications. The linear financial development term shows highly significant effects across most biodiversity measures, with very strong significance levels. While the quadratic terms remain statistically insignificant across all measures, the consistent negative signs on quadratic terms suggest potential for non-linear relationships at higher development levels.

[~ Insert Table 17 about here ~]

5. Conclusions

This paper provides novel empirical evidence on the complex interrelationships between social capital, economic development, financial inclusion, and biodiversity loss across Italian

provinces. Our findings make several important contributions to the emerging literature on biodiversity finance and sustainable development.

First, we document a robust negative relationship between social capital and natural capital across all Italian provinces. Using multiple proxies for social capital, we consistently find that higher social capital is associated with lower biodiversity measures. This counterintuitive finding challenges assumptions about the relationship between social development and environmental conservation, suggesting that the civic engagement and trust that facilitate economic development may simultaneously create pressures on natural ecosystems.

Second, we provide strong support for the Environmental Kuznets Curve (EKC) hypothesis in the context of biodiversity loss. Using innovative instrumental variable specifications that address endogeneity concerns, we find that GDP per capita exhibits an inverted U-shaped relationship with biodiversity degradation across all four of our biodiversity measures (Mean Species Abundance, Biodiversity Intactness Index, Deviation from Potential Natural Vegetation, and PCA Natural). This finding is robust across three different IV specifications and remains statistically significant even after controlling for CO2 emissions, demonstrating that biodiversity impacts capture dimensions of environmental degradation distinct from carbon emissions.

Third, we make a significant methodological contribution by proposing and validating four different biodiversity measures leveraging geospatial and satellite data. These measures provide more comprehensive assessments of ecosystem health than traditional environmental indicators. Importantly, our biodiversity measures show relatively low correlations with CO2 emissions (ranging from 0.22 to 0.27), confirming that they capture additional information beyond standard climate metrics. This finding has important implications for environmental policy and corporate sustainability reporting, suggesting that climate-focused metrics alone may provide an incomplete picture of environmental impact.

Fourth, we establish financial development as a critical transmission mechanism linking social capital, economic growth, and biodiversity loss. Our analysis reveals that financial inclusion consistently shows negative relationships with all biodiversity measures.

In conclusion, this paper demonstrates that achieving sustainable development requires carefully balancing social, economic, and environmental objectives. Our findings suggest that the same social capital that facilitates financial development and economic growth may simultaneously contribute to biodiversity loss, creating a trilemma for policymakers. Addressing this challenge will require innovative policy approaches that harness the benefits

of social capital and financial development while implementing strong environmental safeguards to protect natural capital.

Appendix A: Description of Variables

Variable codes used in regressions are reported in paratheses.

- *Mean species abundance (MSA20):* expresses the mean abundance of original species in disturbed conditions relative to their abundance in undisturbed habitat, as an indicator of the degree to which an ecosystem is intact. The indicator ranges from 1 (intact ecosystem) to 0 (destroyed ecosystem)." (GLOBIO Definition 2016) – from https://abc-map.org/app.html. Observations are available for year 2020.
- *Biodiversity Intactness Index (BII):* summarises the change in ecological communities in response to human pressures. BII is an estimated percentage of the original number of species that remain and their abundance in any given area, despite human impacts.
- *Deviation from potential natural vegetation (DEV_PNV):* is the percentage share of the original AOH measure that is still intact in the year in question. Where Area of habitat (AOH) indicates the share of an area that is inhabited by the species (it is the average calculated across each of the 1070 species in the data source). For example, an Area of habitat of 0.4 means that 40% of the land area considered, falls within that species habitat.
- *Principal Component Analysis on biodiversity measures (PCA Natural):* first principal component of the following three biodiversity measures - Mean Species Abundance (MSA), Biodiversity Intactness Index (BII), and deviation from potential natural vegetation (DEV_PNV).
- *Region (REG):* name of Italian regions.
- *Province (PRO):* name of Italian provinces.
- *Members Donors (DONORS):* from AVIS, soci donatori (members donors) at December 2020.
- *Blood donation (BLOOD):* from AVIS, Percentage of donors over total population (%), at December 2020.
- *Whole Blood (WHOLEBLOOD):* from AVIS, "Sangue intero" (column P), at December 2020
- *Blood_new:* computed as WHOLEBLOOD/ POP.
- *Average Referendum (AVGREF):* average of the percentage of people voting at the Referendums from 1974 to 2022. Data from https://elezionistorico.interno.gov.it/. Province data have not been computed if there were missing data for at least one year.

- *Average Referendum - computed excluding #n/a (AVGREF_ALL):* average of the percentage of people voting at the Referendums from 1974 to 2022. Data from https://elezionistorico.interno.gov.it/. Province data have been computed for every province, excluding missing data.
- *Average Referendum - computed excluding years 2022 and 16A (AVGREF_EXCL2):* average of the percentage of people voting at the Referendums from 1974 to 2022. Data from https://elezionistorico.interno.gov.it/. Province data have been computed for every province, excluding missing data. It excludes from the computation the referendums of years 2022 and 2016A.
- *Referendum 2002 to 1974 (from REF22 to REF74):* percentage of people voting at the Referendum in a given year from https://elezionistorico.interno.gov.it/, observations from 1974 to 2022.
- *Number of Non profit organizations (NOPRO):* from Census data for year 2020.
- *Number of Non profit organizations/size (NOPROS):* computed as NOPRO/GEO.
- *Geographic size (sqm) (GEO):* size in sqm of that region/province, data from https://www.comuniecitta.it/, provided by ISTAT, January 2023.
- *4 Macroareas (North East, North West, Center, South) (MACROAREA):* each region and province has been assigned to one of four macro-areas depending on the location.
- *Population (POP):* number of people in that region/province, data from https://www.comuniecitta.it/, provided by ISTAT, January 2023, expressed in thousands.
- *Population density (POPDENS):* data from https://www.comuniecitta.it/, provided by ISTAT, January 2023.
- *Years of education (EDU):* level of education for resident population over 6 years of age, data from ISTAT, for year 2011.
- *Years of education_squared (EDU2):* computed as EDU^2.
- *Fertility rate (FERT):* total fertility rate, measured as average children per woman, data from ISTAT, for year 2021.
- *Gender (GENDER):* percentage of females on total population – data from ISTAT, for year 2023.
- *Civil Unions (CIV):* civil unions for 100,000 habitants, values 100,000 – data from ISTAT, for year 2021.
- *Crime (CRIME):* total crimes, data from ISTAT, for year 2010.
- *Age (AGE):* average age of population expressed in years, data from ISTAT, for year 2022.

- *Age squared (AGE2):* computed as AGE^2.
- *Life expectancy (LIFE):* total life expectancy at birth, data from ISTAT, for year 2021
- *People in Assistance Institutes (ASSIS):* absolute number of people living in institutes providing assistance, from ISTAT, for year 2011
- *Percentage of users on the target population of the social service (USERS):* percentage of users on the target population of the service, data from ISTAT, for year 2020. Category of beneficiaries persons with disability, Category of service social and health vouchers.
- *Income (INC):* reddito imponibile (euro), expressed in millions, data from ISTAT for year 2020.
- *Income_squared (INC2):* computed as INC^2.
- *GDP:* gross domestic product, expressed in millions USD, constant prices, constant PPP, base year 2015. Data from OECD, for year 2019.
- *GDPpercapita:* computed as GDP/ POP.
- *Percentage of non performing loans (NPL):* tasso di decadimento dei finanziamenti per cassa (%), data from ISTAT, for year 2018.
- *Percentage of workers from Coop organizations (COOP):* percentage of workers from Coop organizations over total workers (%), data from ISTAT, for year 2019
- *Percentage of municipalities offering service social and health vouchers (MUN):* percentage of municipalities offering the service, data from ISTAT, for year 2020. Category of beneficiaries persons with disability, Category of service social and health vouchers.
- *Number of establishments (Tourism) (TOUR):* number of establishments for all accommodation types, data from ISTAT, for year 2021.
- *Number of establishments (Tourism)/size (TOURS):* computed as TOUR/GEO.
- *Judicial inefficiency (JUD_INEFF):* average length to complete first degree trials (only civil, not penal), expressed in years, observations from years 2014 to 2022. Data from SICID.
- *Judicial inefficiency squared (JUD_INEFF2):* computed as JUD_INEFF^2.
- *Financial Inclusion Index (FII)*: a composite weighted average of banking density, credit accessibility, and savings mobilization (year 2022 – source Bank of Italy, "Annual statistics on payment systems by province").
- *Banking density*: measured as bank branches per 10,000 residents (year 2022 – source Bank of Italy, "Annual statistics on payment systems by province").
- *Credit accessibility*: measured as loans per capita (year 2022 – source Bank of Italy, "Annual statistics on payment systems by province").

- *Savings mobilization*: measured as deposits per capita (year 2022 – source Bank of Italy, "Annual statistics on payment systems by province").

Table 1 - Panel A: Summary Statistics of Social and Natural Capital Variables

Panel A reports basic summary statistics of social capital and natural capital variables. Variable descriptions are in Appendix A.

	Mean	Median	SD	Min	Max	p25	p75	N
Mean Species Abundance	34.7	31.8	15.9	9.9	89.4	24.2	44.2	110
Bio Intactness Index	86.8	86.4	4.59	77.7	97.8	83.3	89.9	110
Natural Capital	762.8	632.5	510.5	8.8	2429.7	411.4	960.4	110
Deviation Natural Veg.	81.02	79.4	13.4	52.9	161.9	71.7	89.1	110
PCA Natural	34.5	33.1	8.5	18.4	61.9	28.6	39.2	110
Blood donation	31.6	31.6	17.1	0	90.9	17.9	42.5	110
Avg. Referendum	53.02	54.98	6.52	38.07	64.12	48.57	57.73	94
Avg. Refer. (All)	50.89	52.46	8.39	28.04	64.12	45.22	57.36	110
Avg. Refer. (Excl.)	53.50	55.57	8.65	29.17	67.56	47.02	60.25	110
No Profit	3304.5	2389	3273	573	25179	1515	3696	110
No Profit (Scaled)	1.5	1.1	1.8	.2	11.1	.7	1.6	110

Table 1 - Panel B: Summary Statistics of Economic, Demographic, and Other Variables

Panel B reports basic summary statistics of economic, demographic, and other variables. Variable descriptions are in Appendix A.

	Mean	Median	SD	Min	Max	p25	p75	N
Geographic size	2771.3	2514.5	1612.9	211	7477	1579	3446	110
Population	533	359.7	584.8	54.8	4038.2	223.1	588.9	110
Pop. density	251.5	165.8	362.5	29.6	2559.1	98.7	260.3	110
Education	9.1	9.2	0.4	8.1	10.4	8.9	9.4	110
Edu. squared	83.6	84.3	7.8	66.1	108.6	78.6	87.9	110
Fertility	1.2	1.2	0.1	.9	1.7	1.2	1.3	110
Gender	51.1	50.9	0.5	50.1	52.1	50.7	51.4	110
Civil Unions	3.1	3	1.8	0	8.4	1.8	4.4	110
Crime	25421.9	14956	39300.5	2810	275414	9200	24216	103
Age	46.8	46.8	1.6	42.8	50	45.8	47.8	110
Age squared	2196.2	2193.3	146.5	1832.1	2500.4	2098.3	2287.2	110
GDP	21120.8	12633.1	32404.6	1438.1	236098	7333.7	22765.3	110
GDPpercapita	35.4	34.9	11.5	4.9	77.6	25.8	43.1	110
Life expectancy	82.5	82.6	0.8	80.3	84	82	83.1	110
Assistance	93.4	67	76.9	12	428	41	118	110
Users	3.1	1.8	4.1	0	25.7	.8	3.6	108
Income	7410.8	4747.5	9521.3	906.7	65735.4	2960.5	8478.7	110
Income squared	1.448e+08	22542630	575871113.5	822217.34	4.321e+09	8764432.4	71888340	110
Non Perf. Loans	2.4	2.2	1.3	.4	7.5	1.5	2.9	110
Coop	4.3	3.8	1.8	1.5	12.2	2.9	5.4	110
Municipality	50.9	47.8	32.9	0	100	24.5	78.8	108
Tourism	7801.4	3525	18092.3	228	135603	1761	6271.5	108
Tourism (scaled)	3.1	1.4	6.1	.07	50.6	.8	2.5	108
Judiciary ineff.	1.2	1.1	0.4	.5	2.5	.8	1.4	107
Jud. inef. squared	1.5	1.2	1.2	.3	6.4	.6	1.9	107

Table 2 - Cross-Correlations: Social and Natural Capital Main Variables

This table reports the cross-correlations of social and natural capital main variables. Variable descriptions are in Appendix A.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Mean Species Abundance	1.000										
(2) Bio Intactness Index	0.812	1.000									
(3) Natural Capital	0.337	0.186	1.000								
(4) Deviation Natural Veg.	0.562	0.475	0.257	1.000							
(5) PCA Natural	0.942	0.774	0.345	0.806	1.000						
(6) Blood donation	-0.131	-0.120	-0.076	-0.077	-0.125	1.000					
(7) Avg. Referendum	-0.090	0.066	-0.072	-0.196	-0.132	0.294	1.000				
(8) Avg. Refer. (All)	-0.097	-0.030	-0.085	-0.303	-0.192	0.126	1.000	1.000			
(9) Avg. Refer. (Excl.)	-0.096	-0.030	-0.082	-0.294	-0.187	0.143	0.999	0.996	1.000		
(10) No Profit	-0.068	-0.135	0.261	-0.221	-0.137	-0.185	0.167	0.269	0.267	1.000	
(11) No Profit (Scaled)	-0.161	-0.177	-0.305	-0.321	-0.245	-0.158	0.161	0.137	0.154	0.512	1.000

Table 3 - Social Capital on Natural Capital (using Mean Species Abundance as proxy of Natural capital)

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including five different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4), No Profit (column 5). Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance	(5) Mean Species Abundance
Blood donation	-0.186*				
	(0.071)				
Avg. Referendum		-213.611***			
		(0.000)			
Avg. Refer. (All)			-164.955***		
			(0.000)		
Avg. Refer. (Excl.)				-159.369***	
				(0.000)	
No Profit (Scaled)					1.112
					(0.251)
Geographic size	0.002**	0.002**	0.003***	0.003***	0.003***
	(0.015)	(0.013)	(0.000)	(0.000)	(0.004)
Education	112.695	303.718***	286.957***	291.548***	109.483
	(0.146)	(0.000)	(0.000)	(0.000)	(0.164)
Edu. squared	-6.027	-16.021***	-15.181***	-15.443***	-5.785
	(0.160)	(0.001)	(0.000)	(0.000)	(0.186)
Fertility	21.759	21.631	26.551	26.529	18.961
	(0.329)	(0.260)	(0.151)	(0.158)	(0.409)
Gender	-0.695	-0.557	0.739	0.828	1.501
	(0.852)	(0.883)	(0.841)	(0.823)	(0.682)
Civil Unions	-0.103	1.595	1.486	1.573	-0.141
	(0.934)	(0.118)	(0.185)	(0.160)	(0.916)
Crime	-0.000**	-0.000*	-0.000*	-0.000*	-0.000**
	(0.048)	(0.067)	(0.086)	(0.081)	(0.028)
Age	2.876*	4.382***	4.604***	4.579***	2.660
	(0.077)	(0.003)	(0.001)	(0.001)	(0.126)
GDPpercapita	0.256	0.776**	0.585**	0.623**	0.155
	(0.375)	(0.025)	(0.039)	(0.032)	(0.601)
Constant	-623.192	-1,527.960***	-1,549.732***	-1,573.435***	-718.188
	(0.172)	(0.001)	(0.000)	(0.000)	(0.117)
Observations	103	94	103	103	103
R-squared	0.216	0.452	0.428	0.426	0.189

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4 - Social Capital on Natural Capital (using Bio Intactness Index as proxy of Natural capital)

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Bio Intactness Index as dependent variable and a set of controls including five different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4), No Profit (column 5). Variable descriptions are in Appendix A.

VARIABLES	(1) Bio Intactness Index	(2) Bio Intactness Index	(3) Bio Intactness Index	(4) Bio Intactness Index	(5) Bio Intactness Index
Blood donation	-0.001*				
	(0.053)				
Avg. Referendum		-0.516***			
		(0.000)			
Avg. Refer. (All)			-0.422***		
			(0.000)		
Avg. Refer. (Excl.)				-0.412***	
				(0.000)	
No Profit (Scaled)					0.003
					(0.378)
Geographic size	0.000	0.000	0.000*	0.000*	0.000
	(0.504)	(0.253)	(0.086)	(0.096)	(0.208)
Education	0.546**	1.193***	0.982***	0.999***	0.532*
	(0.042)	(0.000)	(0.000)	(0.000)	(0.066)
Edu. Squared	-0.029**	-0.063***	-0.052***	-0.053***	-0.028*
	(0.050)	(0.000)	(0.000)	(0.000)	(0.079)
Fertility	0.058	0.057	0.069	0.070	0.050
	(0.281)	(0.249)	(0.193)	(0.199)	(0.385)
Gender	-0.005	0.003	-0.000	0.000	0.002
	(0.651)	(0.709)	(0.991)	(0.992)	(0.853)
Civil Unions	0.002	0.007**	0.006**	0.007**	0.002
	(0.430)	(0.012)	(0.032)	(0.026)	(0.490)
Crime	-0.000**	-0.000***	-0.000**	-0.000**	-0.000**
	(0.013)	(0.008)	(0.029)	(0.027)	(0.021)
Age	0.009**	0.012***	0.013***	0.013***	0.008*
	(0.041)	(0.007)	(0.002)	(0.003)	(0.078)
GDPpercapita	0.000	0.002***	0.001**	0.001**	-0.000
	(0.578)	(0.003)	(0.037)	(0.026)	(0.996)
Constant	-1.943	-5.393***	-4.322***	-4.407***	-2.209
	(0.182)	(0.000)	(0.000)	(0.000)	(0.150)
Observations	103	94	103	103	103
R-squared	0.286	0.500	0.451	0.454	0.255

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5 - Social Capital on Natural Capital (using Deviation Natural Veg. as proxy of Natural capital)

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using DEV_PNV as dependent variable and a set of controls including five different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). Variable descriptions are in Appendix A.

	(1)	(2)	(3)	(4)
VARIABLES	**Deviation Natural Veg.**	**Deviation Natural Veg.**	**Deviation Natural Veg.**	**Deviation Natural Veg.**
Blood donation	-0.080			
	(0.202)			
Avg. Referendum		-99.174***		
		(0.000)		
Avg. Refer. (All)			-44.061**	
			(0.016)	
Avg. Refer. (Excl.)				-44.170**
				(0.014)
Education	-49.158	-1.071	-3.859	-0.678
	(0.492)	(0.990)	(0.960)	(0.993)
Edu. Squared	2.391	-0.188	0.036	-0.138
	(0.544)	(0.966)	(0.993)	(0.974)
Fertility	36.404**	36.948**	37.499**	37.559**
	(0.028)	(0.041)	(0.016)	(0.016)
Gender	1.759	1.380	2.475	2.492
	(0.606)	(0.700)	(0.462)	(0.459)
Civil Unions	0.219	0.924	0.580	0.622
	(0.782)	(0.213)	(0.458)	(0.425)
Crime	-0.000	-0.000	-0.000	-0.000
	(0.232)	(0.245)	(0.307)	(0.296)
Age	2.932***	4.062***	3.321***	3.335***
	(0.010)	(0.002)	(0.003)	(0.002)
GDPpercapita	-0.069	0.204	0.007	0.022
	(0.700)	(0.358)	(0.969)	(0.909)
Constant	62.859	-156.824	-194.022	-209.546
	(0.875)	(0.731)	(0.648)	(0.621)
Observations	103	94	103	103
R-squared	0.207	0.303	0.235	0.238

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 - Social Capital on Natural Capital (using PCA Natural as proxy of Natural capital)

This table reports OLS regression estimates with robust standard errors, pvalues in parenthesis, using SCORE_PC1 as dependent variable and a set of controls including five different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4), No Profit (column 5). Variable descriptions are in Appendix A.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	**PCA Natural**	**PCA Natural**	**PCA Natural**	**PCA Natural**	**PCA Natural**
Blood donation	-0.087				
	(0.101)				
Avg. Referendum		-106.023***			
		(0.000)			
Avg. Refer. (All)			-76.129***		
			(0.000)		
Avg. Refer. (Excl.)				-73.867***	
				(0.000)	
No Profit (Scaled)					0.272
					(0.545)
Geographic size	0.001***	0.001***	0.002***	0.001***	0.001***
	(0.008)	(0.008)	(0.000)	(0.000)	(0.005)
Education	26.941	113.282**	107.241**	109.757***	21.410
	(0.485)	(0.014)	(0.011)	(0.010)	(0.560)
Edu. Squared	-1.500	-6.034**	-5.717**	-5.859**	-1.156
	(0.483)	(0.017)	(0.013)	(0.011)	(0.571)
Fertility	17.407	17.996*	19.604*	19.609*	16.189
	(0.141)	(0.097)	(0.050)	(0.054)	(0.179)
Gender	0.336	0.248	1.012	1.051	1.407
	(0.874)	(0.910)	(0.632)	(0.620)	(0.494)
Civil Unions	0.080	0.897	0.813	0.857	0.045
	(0.903)	(0.105)	(0.179)	(0.156)	(0.949)
Crime	-0.000**	-0.000**	-0.000**	-0.000**	-0.000**
	(0.030)	(0.049)	(0.044)	(0.041)	(0.033)
Age	1.879**	2.771***	2.675***	2.667***	1.750**
	(0.025)	(0.001)	(0.000)	(0.000)	(0.048)
GDPpercapita	0.076	0.339*	0.228	0.246	0.035
	(0.610)	(0.061)	(0.127)	(0.105)	(0.822)
Constant	-215.172	-621.678**	-642.893***	-655.681***	-242.723
	(0.361)	(0.018)	(0.008)	(0.007)	(0.287)
Observations	103	94	103	103	103
R-squared	0.220	0.419	0.393	0.393	0.194

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7 - Instrumental Variables Specification using Avg. Refer. (All), Avg. Refer. (All) squared, Blood donation, and Blood donation squared as Instruments

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). The specification used is: ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind (GDPpercapita GDPpercapita2 = AVGREF_ALL AVGREF_ALL2 Blood_new Blood_new2), robust. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance Neg.	(2) Bio Intactness Index Neg.	(3) Deviation Natural Veg. Neg.	(4) PCA Natural Neg.
GDPpercapita	8.473**	0.026**	0.631	3.425**
	(0.016)	(0.014)	(0.747)	(0.032)
GDPpercapita squared	-0.090*	-0.000*	0.007	-0.033
	(0.072)	(0.057)	(0.802)	(0.154)
Education	-238.268	-1.042	131.839	-57.809
	(0.263)	(0.110)	(0.279)	(0.530)
Edu. squared	11.561	0.053	-7.587	2.499
	(0.328)	(0.142)	(0.263)	(0.626)
Fertility	-83.778*	-0.192	-71.783***	-50.763**
	(0.053)	(0.128)	(0.004)	(0.015)
Gender	-0.917	-0.007	1.535	0.042
	(0.904)	(0.742)	(0.726)	(0.991)
Civil Unions	-2.816	-0.009	-2.161*	-1.642
	(0.228)	(0.151)	(0.084)	(0.158)
Crime	0.000	0.000*	-0.000	0.000
	(0.124)	(0.080)	(0.873)	(0.217)
Age	-5.140**	-0.015**	-3.786***	-2.956***
	(0.028)	(0.020)	(0.003)	(0.005)
2.Industry	-18.954***	-0.043***	-5.905**	-8.816***
	(0.000)	(0.002)	(0.044)	(0.001)
3.Industry	-29.468**	-0.073**	-1.904	-11.831**
	(0.016)	(0.012)	(0.730)	(0.031)
Constant	1,397.856	5.031	-486.638	412.810
	(0.211)	(0.126)	(0.466)	(0.409)
Observations	103	103	103	103

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8 - Instrumental Variables Specification with z, z_squared and 1/z in the First Step

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). This specification includes as additional control for GDP per capita squared, the predicted values squared obtained from the first step regression: reg GDPpercapita AVGREF_ALL AVGREF_ALL2 oneoverAVGREF_ALL EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind where we manually specify the structure of the instruments z, z_squared and 1/z in the first step. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance Neg.	(2) Bio Intactness Index Neg.	(3) Deviation Natural Veg. neg.	(4) PCA Natural Neg.
GDPpercapita	3.396*	0.017***	0.349	1.400
	(0.091)	(0.001)	(0.774)	(0.170)
GDPpercapita2	-0.011	-0.000**	0.010	-0.002
	(0.648)	(0.010)	(0.520)	(0.892)
Education	4.390	-0.632	135.145	36.349
	(0.976)	(0.108)	(0.141)	(0.618)
Edu. squared	-2.177	0.030	-7.710	-2.816
	(0.781)	(0.164)	(0.127)	(0.481)
Fertility	-113.112**	-0.247**	-68.461***	-61.187**
	(0.019)	(0.017)	(0.005)	(0.010)
Gender	7.882	0.008	1.335	3.374
	(0.210)	(0.629)	(0.677)	(0.251)
Civil Unions	-4.590*	-0.012*	-1.975*	-2.277*
	(0.079)	(0.057)	(0.063)	(0.067)
Crime	0.000	0.000**	-0.000	0.000
	(0.806)	(0.019)	(0.754)	(0.946)
Age	-5.090**	-0.015***	-3.644***	-2.900***
	(0.020)	(0.005)	(0.004)	(0.008)
2.Industry	-17.584***	-0.041***	-5.466*	-8.176***
	(0.004)	(0.003)	(0.051)	(0.005)
3.Industry	-18.610**	-0.056***	-1.329	-7.508*
	(0.025)	(0.001)	(0.760)	(0.066)
Constant	-4.352	2.654	-501.070	-130.080
	(0.996)	(0.215)	(0.303)	(0.756)
Observations	103	103	103	103

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9 - Instrumental Variables Specification with Higher Powers of Control Variables as Additional Instruments

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). The specification used is: ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind (GDPpercapita GDPpercapita2 = AVGREF_ALL AVGREF_ALL2 Blood_new Blood_new2 EDU3 EDU4 GENDER2 AGE2), robust. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance Neg.	(2) Bio Intactness Index Neg.	(3) Deviation Natural Veg. Neg.	(4) PCA Natural Neg.
GDPpercapita	7.179***	0.018***	2.888**	3.508***
	(0.006)	(0.006)	(0.015)	(0.005)
GDPpercapita squared	-0.070**	-0.000*	-0.026*	-0.034**
	(0.047)	(0.064)	(0.092)	(0.041)
Education	-175.545	-0.672	34.470	-58.734
	(0.276)	(0.112)	(0.680)	(0.444)
Edu. squared	8.004	0.032	-2.140	2.532
	(0.364)	(0.165)	(0.641)	(0.547)
Fertility	-91.686**	-0.240**	-63.869***	-51.773***
	(0.019)	(0.021)	(0.001)	(0.007)
Gender	1.386	0.007	-1.664	0.105
	(0.835)	(0.730)	(0.632)	(0.974)
Civil Unions	-3.293	-0.012*	-1.666	-1.698
	(0.152)	(0.051)	(0.111)	(0.128)
Crime	0.000*	0.000*	0.000	0.000*
	(0.095)	(0.094)	(0.146)	(0.084)
Age	-5.139**	-0.015***	-3.951***	-2.998***
	(0.018)	(0.006)	(0.001)	(0.005)
2.Industry	-18.637***	-0.041***	-6.891***	-8.948***
	(0.000)	(0.002)	(0.006)	(0.000)
3.Industry	-26.699***	-0.057***	-6.704	-12.001**
	(0.010)	(0.002)	(0.159)	(0.017)
Constant	1,034.999	2.889	71.173	416.749
	(0.242)	(0.219)	(0.873)	(0.318)
Observations	103	103	103	103

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10 - Including CO2 as Additional Control Variable

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). The specification used is: ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind (GDPpercapita GDPpercapita2 = AVGREF_ALL AVGREF_ALL2 Blood_new Blood_new2 EDU3 EDU4 GENDER2 AGE2), robust. It includes CO2 as additional control variable. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance Neg.	(2) Bio Intactness Index Neg.	(3) Deviation Natural Veg. Neg.	(4) PCA Natural Neg.
GDPpercapita	6.895**	0.017**	3.072**	3.446**
	(0.022)	(0.037)	(0.030)	(0.016)
GDPpercapita2	-0.068*	-0.000	-0.028	-0.033*
	(0.092)	(0.150)	(0.127)	(0.076)
Education	-172.980	-0.653	29.286	-59.081
	(0.317)	(0.158)	(0.736)	(0.467)
Edu. Squared	7.941	0.031	-1.874	2.576
	(0.402)	(0.216)	(0.694)	(0.563)
Fertility	-87.551**	-0.230**	-64.704***	-50.398***
	(0.020)	(0.022)	(0.001)	(0.007)
Gender	0.988	0.006	-1.686	-0.054
	(0.880)	(0.751)	(0.631)	(0.986)
Civil Unions	-3.148	-0.012**	-1.678	-1.646
	(0.150)	(0.044)	(0.115)	(0.128)
Crime	0.000	0.000	0.000	0.000
	(0.271)	(0.324)	(0.243)	(0.223)
Age	-4.884**	-0.015**	-4.039***	-2.923***
	(0.028)	(0.011)	(0.001)	(0.008)
CO2	0.000	0.000	-0.000	0.000
	(0.620)	(0.667)	(0.740)	(0.772)
2.Industry	-18.023***	-0.040***	-7.121***	-8.772***
	(0.000)	(0.003)	(0.006)	(0.000)
3.Industry	-26.221**	-0.055***	-7.050	-11.906**
	(0.014)	(0.006)	(0.171)	(0.022)
Constant	1,025.957	2.794	99.217	420.483
	(0.273)	(0.270)	(0.830)	(0.335)
Observations	103	103	103	103

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11 – Financial Development and Mean Species Abundance

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of financial development as dependent variable and a set of controls: Financial Inclusion Index (column 1), Banking Density (column 2), Savings Mobility (column 3), Credit Accessibility (column 4). The proxy used for biodiversity is: Mean Species Abundance. Variable descriptions are in Appendix A.

Variables	**(1)** **Mean Species Abundance**	**(2)** **Mean Species Abundance**	**(3)** **Mean Species Abundance**	**(4)** **Mean Species Abundance**
Financial Inclusion Index	**-4.606**** **(0.019)**			
Banking Density		**-0.030**** **(0.010)**		
Savings Mobility			**-0.008**** **(0.021)**	
Credit Accessibility				**-0.005**** **(0.015)**
Geographic size	0.007***	0.005**	0.004**	0.006***
	(0.003)	(0.048)	(0.024)	(0.005)
Education	258.103	336.481*	458.482	547.476**
	(0.284)	(0.058)	(0.193)	(0.043)
Edu. Squared	-14.064	-18.936*	-24.510	-29.192**
	(0.292)	(0.055)	(0.204)	(0.050)
Fertility	96.048	20.155	113.489	44.704
	(0.155)	(0.575)	(0.177)	(0.355)
Gender	-9.995	-8.200	0.146	1.598
	(0.248)	(0.294)	(0.987)	(0.859)
Civil Unions	6.220*	4.583	6.028*	6.220**
	(0.060)	(0.101)	(0.055)	(0.040)
Crime	0.000	-0.001	0.000	0.001
	(0.933)	(0.174)	(0.774)	(0.197)
Age	40.102	-48.508	79.318	93.484
	(0.717)	(0.517)	(0.530)	(0.392)
Age Squared	-0.338	0.608	-0.809	-0.988
	(0.772)	(0.450)	(0.546)	(0.395)
Income	-0.003	-0.000	-0.001	-0.002
	(0.255)	(0.891)	(0.756)	(0.258)
Income Squared	0.000	0.000	0.000	0.000
	(0.152)	(0.294)	(0.798)	(0.933)
GDPpercapita	3.938*	2.473*	4.290*	2.516*
	(0.056)	(0.062)	(0.056)	(0.078)
Constant	-1,947.598	-115.728	-4,239.105	-4,930.388
	(0.540)	(0.950)	(0.330)	(0.165)
Observations	93	90	91	93

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12 – Financial Development and Biodiversity Intactness Index

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of financial development as dependent variable and a set of controls: Financial Inclusion Index (column 1), Banking Density (column 2), Savings Mobility (column 3), Credit Accessibility (column 4). The proxy used for biodiversity is: Biodiversity Intactness Index. Variable descriptions are in Appendix A.

Variables	**(1)** **Bio Intactness Index**	**(2)** **Bio Intactness Index**	**(3)** **Bio Intactness Index**	**(4)** **Bio Intactness Index**
Financial Inclusion Index	**-0.012**** **(0.013)**			
Banking Density		**-0.000***** **(0.009)**		
Savings Mobility			**-0.000**** **(0.015)**	
Credit Accessibility				**-0.000**** **(0.011)**
Geographic size	0.000***	0.000	0.000*	0.000**
	(0.006)	(0.105)	(0.071)	(0.019)
Education	1.044*	1.506***	1.524*	1.829***
	(0.067)	(0.001)	(0.085)	(0.007)
Edu. Squared	-0.056*	-0.084***	-0.081*	-0.097***
	(0.075)	(0.001)	(0.094)	(0.009)
Fertility	0.253	0.089	0.316	0.116
	(0.116)	(0.445)	(0.137)	(0.354)
Gender	-0.020	-0.021	0.003	0.011
	(0.415)	(0.398)	(0.918)	(0.646)
Civil Unions	0.021**	0.017**	0.021**	0.021**
	(0.020)	(0.038)	(0.019)	(0.014)
Crime	-0.000	-0.000**	-0.000	0.000
	(0.139)	(0.015)	(0.608)	(0.852)
Age	0.038	-0.122	0.167	0.185
	(0.885)	(0.547)	(0.597)	(0.500)
Age Squared	-0.000	0.002	-0.002	-0.002
	(0.962)	(0.462)	(0.627)	(0.512)
Income	-0.000	0.000	0.000	0.000
	(0.874)	(0.379)	(0.298)	(0.840)
Income Squared	0.000	0.000	-0.000	-0.000
	(0.183)	(0.142)	(0.612)	(0.757)
GDPpercapita	0.009*	0.007*	0.011*	0.005
	(0.072)	(0.066)	(0.065)	(0.139)
Constant	-4.852	-2.716	-11.155	-12.992
	(0.503)	(0.581)	(0.297)	(0.132)
Observations	93	90	91	93

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 13 – Financial Development and Deviation Natural Veg.

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of financial development as dependent variable and a set of controls: Financial Inclusion Index (column 1), Banking Density (column 2), Savings Mobility (column 3), Credit Accessibility (column 4). The proxy used for biodiversity is: Deviation Natural Vegetation. Variable descriptions are in Appendix A.

	(1)	(2)	(3)	(4)
Variables	**Deviation Natural Veg.**	**Deviation Natural Veg.**	**Deviation Natural Veg.**	**Deviation Natural Veg.**
Financial Inclusion Index	**-1.892****			
	(0.020)			
Banking Density		**-0.013****		
		(0.012)		
Savings Mobility			**-0.003****	
			(0.033)	
Credit Accessibility				**-0.002****
				(0.023)
Geographic size	0.003***	0.002**	0.002**	0.003***
	(0.001)	(0.038)	(0.024)	(0.004)
Education	-76.945	-26.365	-60.589	46.812
	(0.461)	(0.817)	(0.731)	(0.732)
Edu. Squared	3.779	0.705	3.153	-2.699
	(0.251)	(0.532)	(0.238)	(0.847)
Fertility	72.914***	43.372***	83.404**	52.413**
	(0.009)	(0.007)	(0.036)	(0.026)
Gender	-2.118	-2.131	1.232	2.646
	(0.577)	(0.563)	(0.795)	(0.560)
Civil Unions	2.987**	2.339*	2.979*	3.084**
	(0.049)	(0.077)	(0.053)	(0.031)
Crime	0.000	-0.000	0.000	0.000
	(0.824)	(0.522)	(0.605)	(0.215)
Age	48.504	26.333	66.003	73.066
	(0.268)	(0.411)	(0.261)	(0.148)
Age Squared	-0.454	-0.454	-0.658	-0.749
	(0.326)	(0.535)	(0.289)	(0.164)
Income	-0.001	-0.000	-0.000	-0.001
	(0.320)	(0.647)	(0.912)	(0.358)
Income Squared	0.000	0.000	-0.000	-0.000
	(0.386)	(0.587)	(0.674)	(0.573)
GDPpercapita	1.379*	0.882	1.609	0.824
	(0.083)	(0.108)	(0.108)	(0.163)
Constant	-806.319	-436.729	-1,456.772	-2,117.342
	(0.543)	(0.665)	(0.468)	(0.205)
Observations	93	90	91	93

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14 – Financial Development and PCA Natural

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of financial development as dependent variable and a set of controls: Financial Inclusion Index (column 1), Banking Density (column 2), Savings Mobility (column 3), Credit Accessibility (column 4). The proxy used for biodiversity is: PCA Natural. Variable descriptions are in Appendix A.

	(1)	(2)	(3)	(4)
Variables	**PCA Natural**	**PCA Natural**	**PCA Natural**	**PCA Natural**
Financial Inclusion Index	**-2.261****			
	(0.017)			
Banking Density		**-0.015*****		
		(0.009)		
Savings Mobility			**-0.004****	
			(0.021)	
Credit Accessibility				**-0.002****
				(0.015)
Geographic size	0.004***	0.002**	0.002**	0.003***
	(0.002)	(0.039)	(0.021)	(0.004)
Education	79.596	122.909	160.917	222.918*
	(0.488)	(0.192)	(0.364)	(0.098)
Edu. Squared	-4.444	-7.118	-8.625	-11.939
	(0.484)	(0.174)	(0.374)	(0.107)
Fertility	55.787*	18.966	65.214	30.735
	(0.085)	(0.246)	(0.120)	(0.197)
Gender	-4.391	-3.706	0.375	1.300
	(0.285)	(0.323)	(0.936)	(0.771)
Civil Unions	3.167*	2.369*	3.091*	3.192**
	(0.052)	(0.088)	(0.050)	(0.033)
Crime	0.000	-0.000	0.000	0.000
	(0.905)	(0.223)	(0.723)	(0.193)
Age	27.931	-11.868	47.550	54.818
	(0.596)	(0.739)	(0.448)	(0.307)
Age Squared	-0.247	0.179	-0.481	-0.574
	(0.657)	(0.641)	(0.469)	(0.316)
Income	-0.001	-0.000	-0.000	-0.001
	(0.263)	(0.825)	(0.792)	(0.269)
Income Squared	0.000	0.000	0.000	-0.000
	(0.184)	(0.340)	(0.927)	(0.944)
GDPpercapita	1.871*	1.179*	2.066*	1.180*
	(0.057)	(0.065)	(0.062)	(0.088)
Constant	-957.591	-158.149	-2,007.491	-2,444.071
	(0.530)	(0.862)	(0.352)	(0.163)
Observations	93	90	91	93

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 15 – Financial Kuznets Curve - Instrumental Variables Specification using Avg. Refer. (All), Avg. Refer. (All) squared, Blood donation, and Blood donation squared as Instruments

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). The specification used is: ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE GDPpercapita i.Ind (fii_percent fii_percent2 = AVGREF AVGREF2 Blood_new Blood_new2) if fii_percent<80, robust. Variable descriptions are in Appendix A.

	(1)	(2)	(3)	(4)
Variables	**Mean Species Abundance Neg.**	**Bio Intactness Index Neg.**	**Deviation Natural Veg. Neg.**	**PCA Natural Neg.**
Financial Inclusion Index	**4.420***	**0.012****	**2.145***	**2.255***
	(0.091)	**(0.038)**	**(0.084)**	**(0.085)**
Financial Inclusion Index squared	**0.011**	**-0.000**	**0.006**	**0.006**
	(0.933)	**(0.978)**	**(0.920)**	**(0.929)**
Education	-78.459	-0.643	106.683	-2.809
	(0.641)	(0.107)	(0.245)	(0.974)
Edu. Squared	4.363	0.034	-5.273	0.326
	(0.634)	(0.115)	(0.292)	(0.944)
Fertility	-81.564	-0.201	-68.157	-48.980
	(0.439)	(0.431)	(0.212)	(0.361)
Gender	17.063	0.037	6.541	8.252
	(0.450)	(0.499)	(0.575)	(0.473)
Civil Unions	-5.441	-0.017	-3.155	-2.910
	(0.534)	(0.407)	(0.478)	(0.514)
Crime	0.000	0.000	0.000	0.000
	(0.527)	(0.469)	(0.499)	(0.514)
Age	-9.139	-0.026	-6.597*	-5.221
	(0.171)	(0.105)	(0.055)	(0.123)
GDPpercapita	-4.118	-0.009	-1.859	-2.064
	(0.506)	(0.526)	(0.542)	(0.510)
2.Ind	4.568	0.011	3.428	2.642
	(0.860)	(0.863)	(0.794)	(0.841)
3.Ind	-11.974	-0.019	-3.074	-5.397
	(0.730)	(0.768)	(0.851)	(0.759)
Constant	20.471	1.799	-538.172	-130.435
	(0.987)	(0.548)	(0.408)	(0.837)
Observations	93	93	93	93

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 16 - Financial Kuznets Curve - Instrumental Variables Specification with z, z_squared and 1/z in the First Step

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). This specification includes as additional control for GDP per capita squared, the predicted values squared obtained from the first step regression: reg fii_percent AVGREF AVGREF2 oneoverAVGREF Blood_new EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind where we manually specify the structure of the instruments z, z_squared and 1/z in the first step. Variable descriptions are in Appendix A.

Variables	(1) Mean Species Abundance Neg.	(2) Bio Intactness Index Neg.	(3) Deviation Natural Veg. Neg.	(4) PCA Natural Neg.
Financial Inclusion Index	**8.421***	**0.019*****	**3.622****	**4.175***
	(0.070)	**(0.003)**	**(0.029)**	**(0.057)**
Financial Inclusion Index squared	**-0.037**	**-0.000*****	**-0.024**	**-0.020**
	(0.514)	**(0.010)**	**(0.328)**	**(0.451)**
Education	-81.668	-0.648**	105.533	-4.340
	(0.689)	(0.027)	(0.241)	(0.964)
Edu. squared	4.910	0.035**	-5.122	0.575
	(0.661)	(0.029)	(0.301)	(0.914)
Fertility	-96.424	-0.136	-64.317*	-53.671
	(0.282)	(0.264)	(0.065)	(0.205)
Gender	25.486	0.032	7.718	11.788
	(0.162)	(0.240)	(0.276)	(0.170)
Cicil Unions	-7.636	-0.013	-3.158	-3.751
	(0.225)	(0.172)	(0.181)	(0.207)
Crime	0.000	0.000	0.000	0.000
	(0.523)	(0.457)	(0.491)	(0.511)
Age	-14.961*	-0.032***	-8.432***	-7.932**
	(0.080)	(0.005)	(0.008)	(0.049)
GDPpercapita	-5.461	-0.007	-1.834	-2.572
	(0.243)	(0.279)	(0.285)	(0.245)
2.Ind	6.961	-0.007	2.071	3.205
	(0.654)	(0.759)	(0.741)	(0.666)
3.Ind	-10.487	-0.012	-2.048	-4.559
	(0.792)	(0.714)	(0.884)	(0.809)
Constant	-142.410	2.154	-532.779	-191.446
	(0.905)	(0.269)	(0.266)	(0.730)
Observations	93	93	93	93

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 17 - Financial Kuznets Curve - Instrumental Variables Specification with Higher Powers of Control Variables as Additional Instruments

This table reports IV regression estimates with robust standard errors, p values in parenthesis, using four different measures of biodiversity loss as dependent variable and a set of controls and industry fixed effects: Mean Species Abundance Negative (column 1), Bio Intactness Index Negative (column 2), Deviation Natural Veg. Negative (column 3), PCA Natural Negative (column 4). The specification used is: ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE i.Ind GDPpercapita (fii_percent fii_percent2 = AVGREF Blood_new AVGREF_ALL AVGREF_ALL2 Blood_new Blood_new2 EDU3 EDU4 GENDER2 AGE2) if fii_percent<80, robust. Variable descriptions are in Appendix A.

Variables	(1) Mean Species Abundance Neg.	(2) Bio Intactness Index Neg.	(3) Deviation Natural Veg. Neg.	(4) PCA Natural Neg.
Financial Inclusion Index	**3.487*** **	**0.011*** **	**1.434**	**1.712** **
	(0.003)	**(0.000)**	**(0.148)**	**(0.012)**
Financial Inclusion Index squared	**-0.031**	**-0.000**	**0.017**	**-0.008**
	(0.288)	**(0.133)**	**(0.525)**	**(0.659)**
Education	-77.572	-0.642***	107.247	-2.322
	(0.377)	(0.006)	(0.233)	(0.966)
Edu. Squared	4.026	0.034***	-5.361	0.173
	(0.408)	(0.009)	(0.278)	(0.954)
Fertility	-39.752	-0.097	-67.158***	-32.633*
	(0.168)	(0.169)	(0.009)	(0.051)
Gender	7.156	0.013	5.384	4.142
	(0.172)	(0.356)	(0.270)	(0.176)
Civil Unions	-1.607	-0.008	-2.907	-1.370
	(0.409)	(0.112)	(0.105)	(0.222)
Crime	0.000	0.000	0.000	0.000
	(0.281)	(0.198)	(0.160)	(0.202)
Age	-6.495**	-0.020***	-5.617**	-3.951***
	(0.014)	(0.003)	(0.012)	(0.010)
2.Ind	-5.202	-0.014	3.397	-1.125
	(0.387)	(0.344)	(0.509)	(0.740)
3.Ind	-10.356	-0.015	-3.423	-4.864
	(0.555)	(0.491)	(0.836)	(0.656)
GDPpercapita	-1.662*	-0.003	-1.712*	-1.081*
	(0.098)	(0.215)	(0.087)	(0.074)
Constant	327.854	2.551*	-520.756	-7.664
	(0.549)	(0.076)	(0.313)	(0.981)
Observations	93	93	93	93
R-squared		0.238		

Robust pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1 - EKC Hypothesis

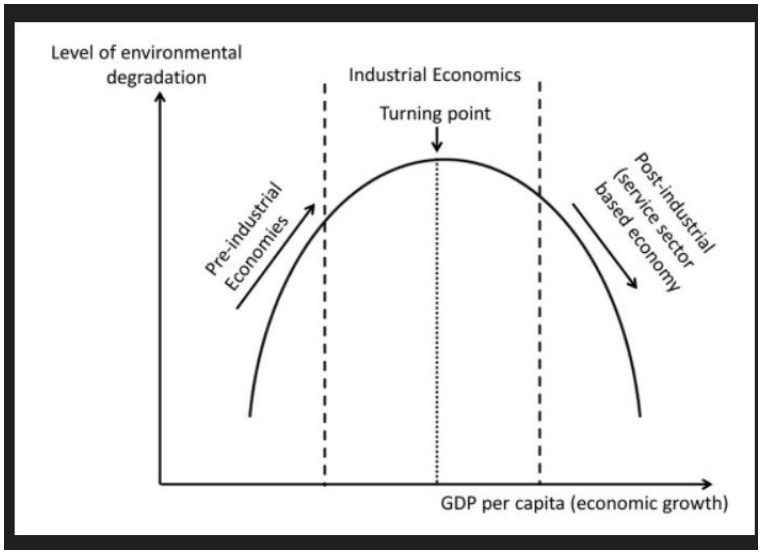


Figure 2 - QGIS Example of Data Retrieve

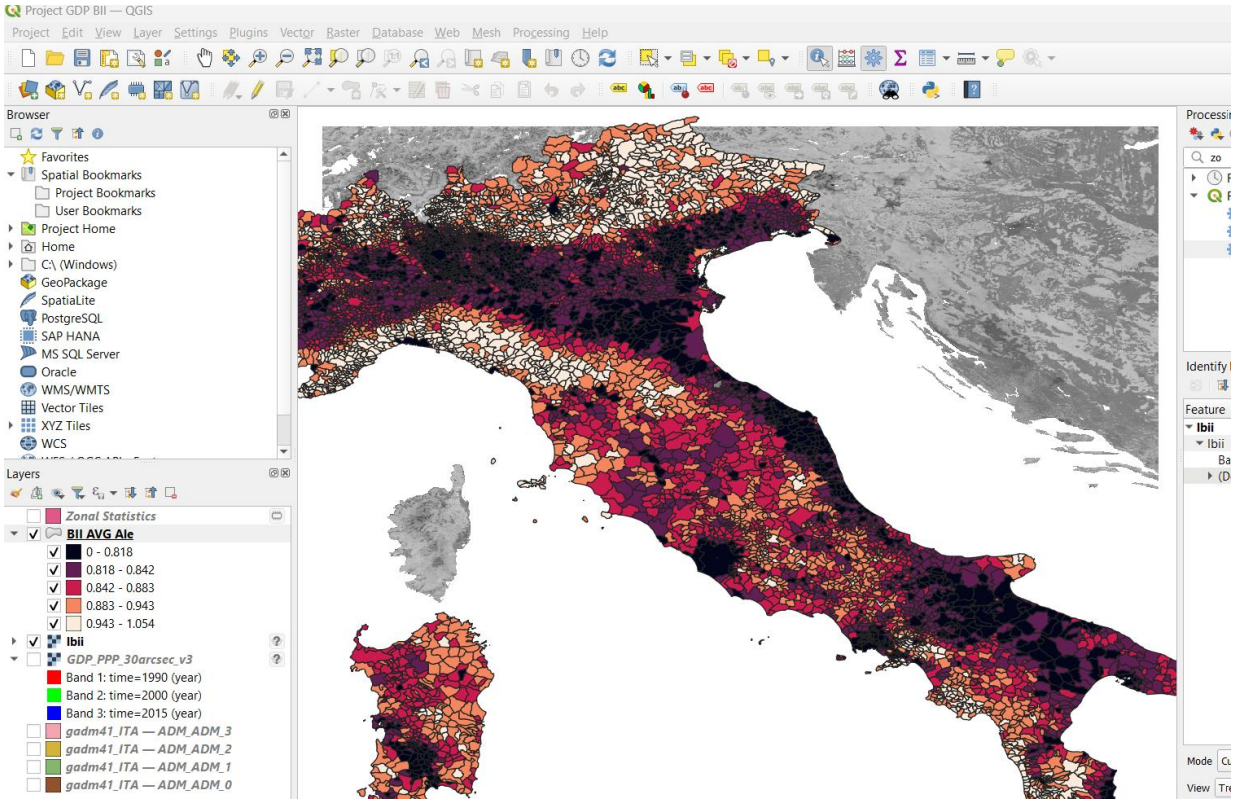


Figure 3 – Referendum 2020 Representation by Province



Figure 4 – Mean Species Abundance 2020 Representation by Province

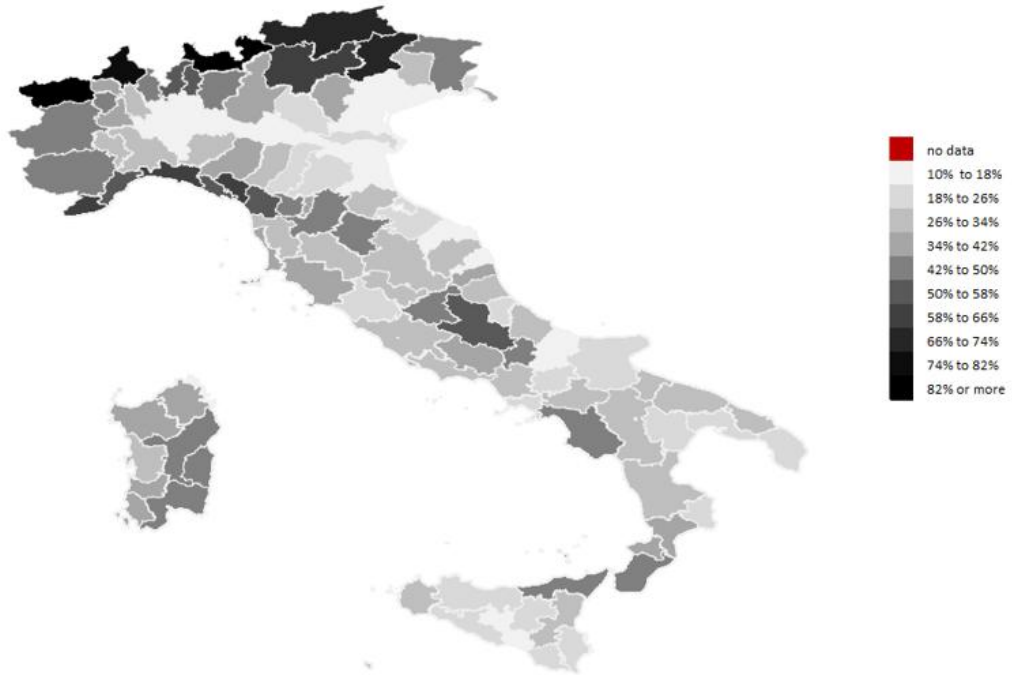


Figure 5 – Blood Donation (scaled by population) Representation by Province

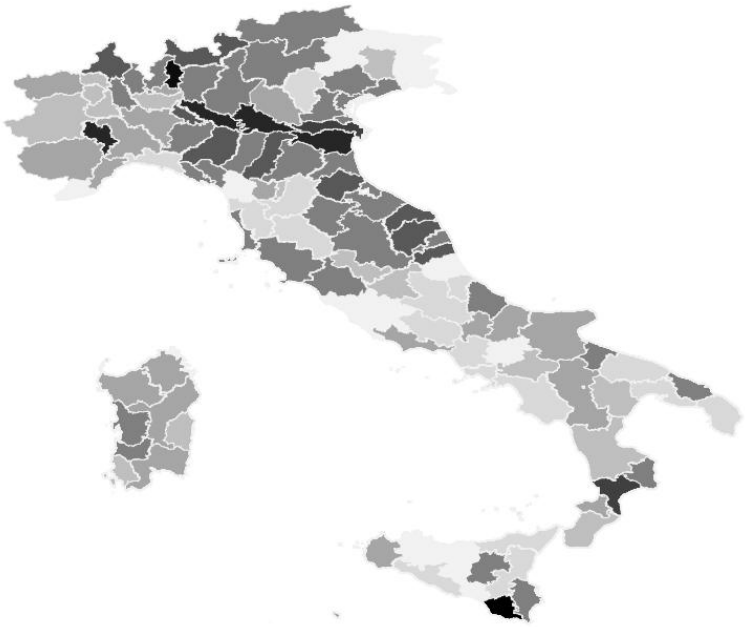
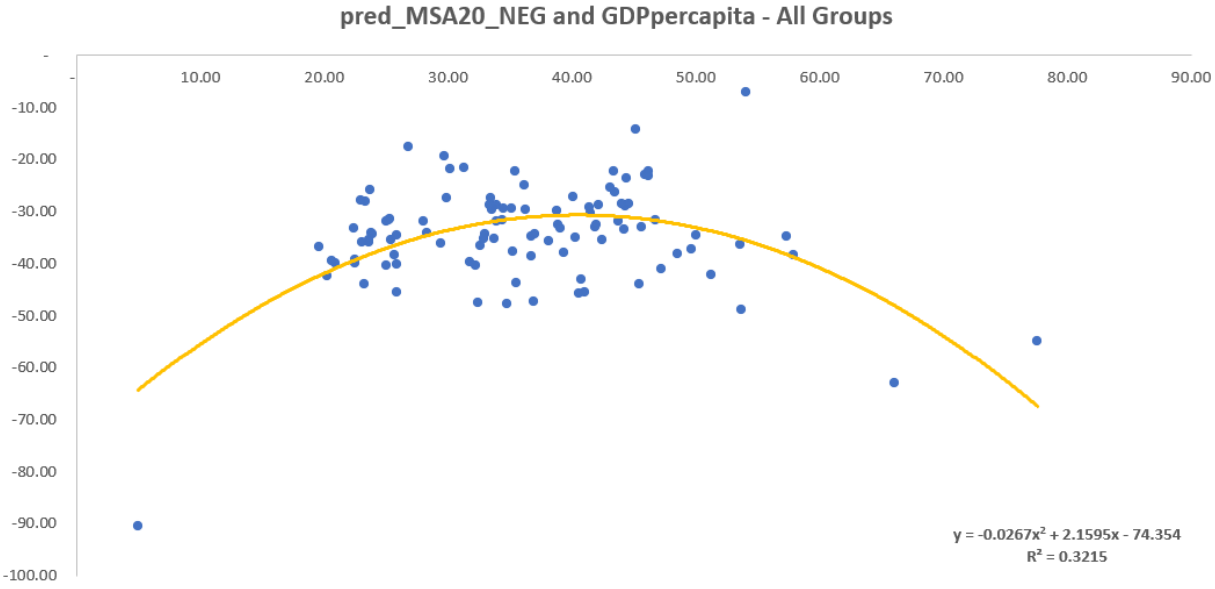


Figure 6 - Inverse U-shaped Relationship between GDP per Capita and Measures of Biodiversity Loss

Scatter plot of the predicted values of Mean Species Abundance loss and GDP per capita, for all industries. Variable descriptions are in Appendix A. The specification to obtain this figure is the following:
ivregress 2sls MSA20_NEG EDU EDU2 FERT GENDER CIV CRIME AGE GDPpercapita2 i.Ind (GDPpercapita = AVGREF_ALL), robust
predict pred_MSA20_NEG if e(sample), xb
twoway (scatter pred_MSA20_NEG GDPpercapita)



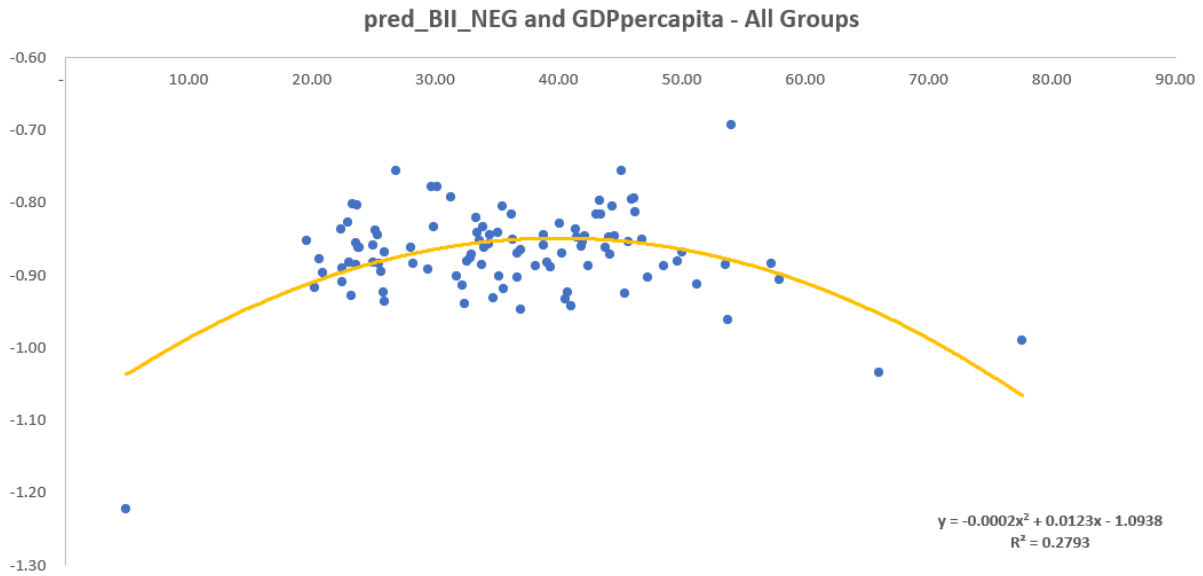
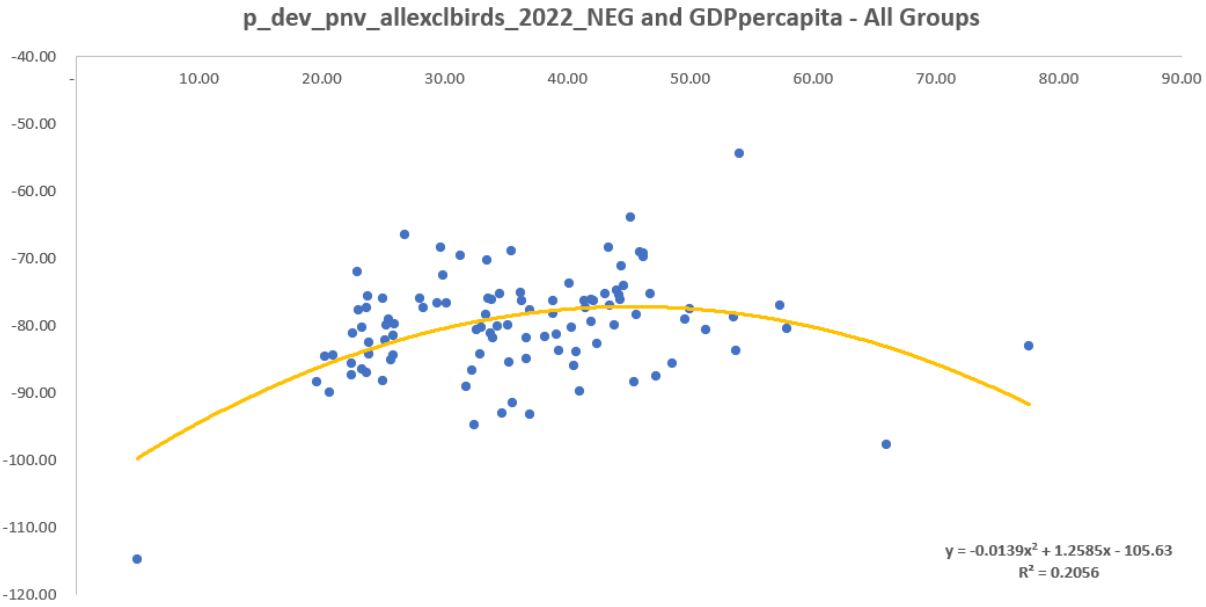
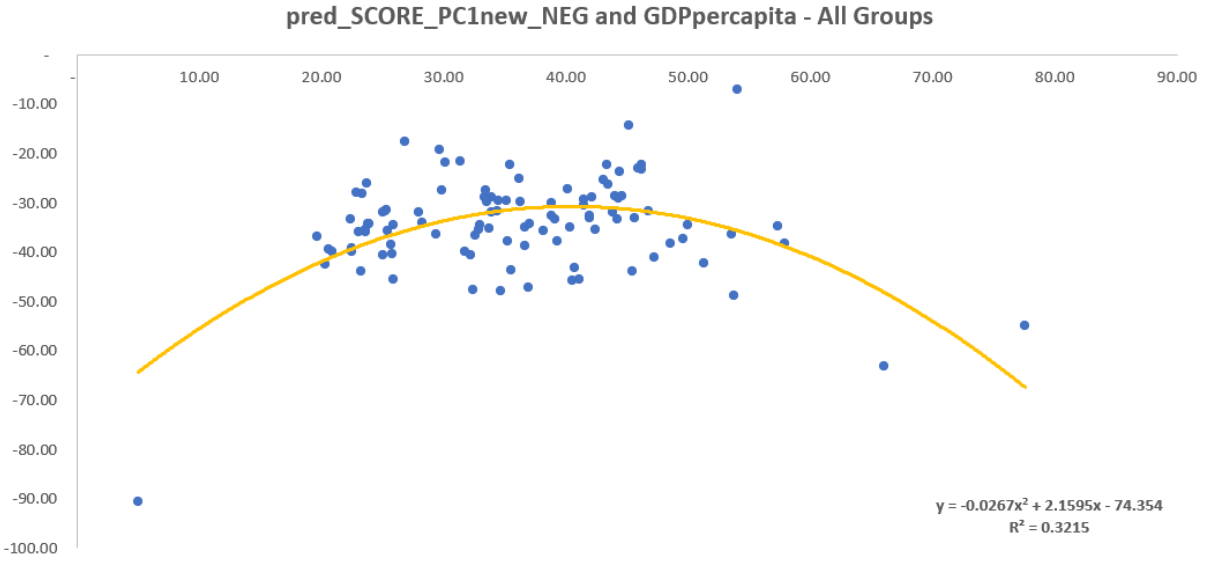


Figure 6 - Inverse U-shaped Relationship between GDP per Capita and Measures of Biodiversity Loss (continued)





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Internet Appendix – Additional Results

"Natural, Social and Financial Capitals"

Oğuzhan Karakaş, Annalisa Tonetto, and Alessa Widmaier

In this Internet Appendix, we analyse how and if the negative effect of social capital on natural capital changes with the level of judiciary efficiency and education across provinces. Firstly, we include the interaction of the social capital measures with a dummy variable called "Efficient" (this dummy variable takes value equal to one if the measure of judiciary inefficiency is lower than the median value across all provinces), and report that these interaction terms are statistically significant and negative for one measure of referendum participation and the measures of social capital remain negative and statistically significant. These results suggest that provinces where the judiciary system is efficient (i.e. lower time to conclude it) contribute to the negative effect of social capital on natural capital, suggesting that there is not a substitution effect of the trust in the legal system that impact favourably natural capital. Moreover, looking at education, the negative effect of social capital on natural capital, is reinforced for provinces with lower levels of education. We also present the results using blood donation as instrument for referendum participation. The following tables report the results.

Table 1.IA, Column 2, reports the results of OLS regressions estimates for *Mean Species Abundance* by Instrumental Variables (IV) with blood donation (*Blood donation*) as instrument for referendum participation (*Avg. Refer. (All)*). It can be noticed that the coefficient of interest remains statistically significant, and the magnitude increases in absolute value.

Table 2.IA reports the results of OLS regressions estimates for *Mean Species Abundance* including measures of law enforcement. The social capital proxies remain statistically and negatively related to natural capital, with the measure of judiciary inefficiency being statistically negatively associated to *Mean Species Abundance* in some cases.

Table 3.IA includes four geographic groups called "*macroareas*" as additional control variables (North East, North West, Center and South). It can be noticed that Macroarea ==3 (North West) has a statistically significant positive effect on *Mean Species Abundance*.

Table 4.IA reports the results of OLS regressions estimates considering *Mean Species Abundance* and including the interaction of the social capital measures with a dummy variable called "Efficient". This dummy variable takes value equal to one if the measure of judiciary inefficiency is lower than the median value across all provinces. These interaction terms are statistically significant and negative only for one measure of referendum participation and the measures of social capital remain negative and statistically significant.

Table 5.IA reports the results of OLS regressions estimates considering *Mean Species Abundance* and including the interaction of the social capital measures with a dummy variable called "Lowedu". This dummy variable takes value equal to one if the measure of education is lower than the median value across all provinces. These interaction terms are not statistically significant while the measures of social capital remain negative and statistically significant. Overall, these results suggest that there is the negative effect of social capital on natural capital, is reinforced for provinces with lower levels of education.

Table 6.IA reports the results of OLS regressions estimates considering *Mean Species Abundance* referring to the subsample of provinces with the dummy "Efficient" equal to one – subsample efficient (that is if the measure of judiciary inefficiency is lower than the median value across all provinces).

Table 7.IA reports the results for the subsample of with the dummy "Efficient" equal to zero – subsample inefficient (that is if the measure of judiciary inefficiency is higher than the median value across all provinces). Comparing the results in these tables, we can conclude that the subsample efficient has greater coefficients in absolute value compared to the sample inefficient.

Table 8.IA reports the results of OLS regressions estimates considering *Mean Species Abundance* referring to the subsample of provinces with the dummy "Lowedu" equal to zero – subsample high (that is if the measure of education is higher than the median value across all provinces).

Table 9.IA reports the results for the subsample of with the dummy "Lowedu" equal to one – subsample low (that is if the measure of education is lower than the median value across all provinces). Comparing the results in these tables, we can conclude that the two subsamples do not differ massively in the estimates, except for the subsample low, having coefficients with higher absolute values coefficients for most of the social capital measures.

A1. Industry Classification

This is how a province falls into the agriculture industry cluster, production or services respectively. A province is assigned to one of the industry groups by attributing weights to each of them. Weights represent the level of total assets for that industry, summed for all the firms in that province obtained from ORBIS.

Agriculture group includes agriculture; horticulture; and livestock.

Production group includes biotechnology and life sciences; chemicals, petroleum, rubber, and plastic; computer hardware; computer software; construction; food and tobacco manufacturing; industrial, electric, and electronic machinery; leather, stone, clay, and glass products; metals and metal products; mining and extraction; miscellaneous manufacturing; printing and publishing; retail; textiles and clothing manufacturing; transport manufacturing; transport, freight and storage; utilities; waste management and treatment; wholesale; and wood, furniture and paper manufacturing.

Services group includes banking, insurance, and financial services; business services; communications; information services; media and broadcasting; property services; public administration, education, health social services; and travel, personal and leisure.

Table 10.IA reports the summary statistics by industry groups, where 70 Provinces are assigned to Agriculture, 29 to Production and 7 to Services. It can be noticed that the Agriculture cluster shows lower values of biodiversity measures.

[~ Insert Table 10.IA about here ~]

A2. Experimental Design

In this section, we use the discontinuities created by provincial borders as a natural experiment to provide evidence on the relationship between social development and biodiversity. We compare a pair of neighbouring provinces, Trento and Belluno, which belong to two different regions (Trentino Alto Adige and Veneto). Our approach allows us to identify province-specific social determinants of differences in biodiversity across provinces while keeping environmental factors as constant as possible. In this experimental design, provincial borders can be treated as a natural experiment to measure the effect of social development on biodiversity, and our identification strategy relies on the fact that differences in biodiversity between the two provinces on opposite sides of the border are determined by differences in socioeconomic and institutional characteristics between the two provinces.
Trento is an Italian province that belongs to Trentino-Alto Adige which is an autonomous province ("Provincia Autonoma"). It is called autonomous because the special statute gives it particular forms of autonomy, including legislative autonomy. This autonomy makes it similar to the regions and differentiates it from other provinces, which have much smaller tasks.

We estimate the effects of the introduction of an exogenous social policy in the province of Trento in a Differences-in-Differences (DiD) set-up, and compare the pre and post regulation change in biodiversity in Trento versus the pre and post regulation change in biodiversity for another province with a similar habitat (Belluno).

We refer to the "Legge Provinciale 27 luglio 2007, n. 13" which is titled "Politiche sociali nella provincia di Trento" (Social Policies in the Province of Trento). This law is significant because it establishes a comprehensive framework for social services and community support in the Trentino province. Some key aspects of this law include, for example, the organization of an integrated system of social policies, the recognition of the role of families and social networks in providing care and support, the promotion of social inclusion and prevention of marginalization, the definition of minimum service standards and the support for voluntary work and third sector organizations.

The Legge Provinciale 13/2007 includes several practical mechanisms to facilitate social assistance. For example, the law established a system where social services are planned and coordinated at both provincial and local community levels (Integrated Service Planning). This means that services can be better tailored to local needs while maintaining consistent standards across the province. Additionally, the law introduced the concept of a single point of access for

citizens seeking social services, facilitating people to get information and access the services they need without having to navigate multiple offices (Social Help Desk). Moreover, the law recognizes and provides support for family members who act as primary caregivers, including measures like respite care and training programs. The law also strengthens the role of social cooperatives and non-profit organizations in providing services, creating a more diverse and flexible system of care. It includes provisions for various forms of financial assistance for families and individuals in need, including housing support and care allowances. Finally, the law emphasizes preventive social work rather than just crisis intervention, including community development programs and early intervention services.

We estimate the following difference-in-differences specification:

$$\boldsymbol{Y_{it} = \alpha_0 + \beta_1 Post_t + \beta_2 Treated_i + \beta_3 (Post_t \times Treated_i) + \varepsilon_{it}}$$

where *Y_{it}* represents our biodiversity measures (Mean Species Abundance or Natural Capital) for province *i* in year *t*. *Post_t* is a dummy variable equal to 1 for years after 2007 (when the Legge Provinciale 13/2007 was introduced) and 0 otherwise. *Treated_i* is a dummy variable equal to 1 for the province of Trento and 0 for Belluno. The coefficient of interest is β_3, which captures the differential change in biodiversity in Trento relative to Belluno following the introduction of the social policy. ε_{it} is the error term.

Table 11.IA presents the results of the DiD regression estimates using two different measures of biodiversity as dependent variable: Mean Species Abundance, and Natural Capital. The years for this experimental design are from 1992 to 2020. It can be noticed that the interaction term of interest "*Did*" is negative and statistically significant for both the measures. This further confirms that the introduction of a specific social policy has had the effect to decrease the biodiversity after its introduction.

[~ Insert Table 11.IA about here ~]

Figure 1.IA shows the comparison of two Biodiversity measures (Natural Capital and Mean Species Abundance) between the province of Trento (treated) and the province of Belluno (control). The Natural Capital of Trento is constantly higher than the Natural Capital of Belluno. On the other hand, the Mean Species Abundance for Belluno is higher than for Trento. The reason why we have different patterns on biodiversity metrics, for provinces with similar

habitat, is because each biodiversity metric is capturing specific features of biodiversity. As already mentioned, the Biodiversity metrics are very stable across time.

[~ Insert Figure 1.IA about here ~]

Finally, Figure 2.IA presents the comparison of attendance to Referendum (proxy for social capital) for the two provinces in analysis. Trento displays a higher social capital compared to Belluno, for all the observations in analysis, except in 2009.

[~ Insert Figure 2.IA about here ~]

In both charts, the year of the introduction of the social policy in Trento (2007) is highlighted with a grey dashed line.
The identification assumption underlying our DiD strategy is that, in the absence of the social policy intervention, biodiversity trends would have been parallel between Trento and Belluno. While this assumption is inherently untestable for the post-treatment period, we can examine the pre-trends in our biodiversity measures to assess its plausibility.

To formally test the parallel trends assumption underlying our DiD strategy, we estimate an event study specification following the methodology proposed by Callaway and Sant'Anna (2021) for difference-in-differences designs with multiple time periods. Specifically, we estimate:

$$\boldsymbol{Y_{it} = \alpha_0 + \sum_{k=1}^{K} \beta_k (Year_k \times Treated_i) + \gamma_i + \lambda_t + \varepsilon_{it}}$$

where *Y_{it}* is our biodiversity measure of interest, *Treated_i* indicates Trento province, *Year_k* are dummy variables for each year (except one base year before the treatment, typically 2006 in our case), *γ_i* are province fixed effects, and *λ_t* are year fixed effects. If the parallel trends assumption holds, we expect the coefficients β_k for years prior to 2007 to be statistically indistinguishable from zero, indicating no systematic differences in biodiversity trends between Trento and Belluno before the social policy implementation.

Our event study reveals an interesting pattern. Prior to the 2007 policy implementation, Trento exhibited slightly higher Mean Species Abundance values compared to Belluno (positive coefficients ranging from 0.001 to 0.005). However, following the introduction of the social policy, this relationship reversed, with increasingly negative coefficients (from -0.001 in 2007 to -0.006 in 2020). Interestingly, both Mean Species Abundance and Natural Capital show a clear pattern of declining values in Trento relative to Belluno following the 2007 social policy implementation (see Figures 3.IA and 4.IA). This consistency in post-policy effects across different biodiversity measures strengthens our main findings about the negative relationship between social capital and biodiversity, although the parallel trends assumption may not hold perfectly in our setting.

[~ Insert Figure 3.IA about here ~]

[~ Insert Figure 4.IA about here ~]

We run the same estimations, considering a shorter time window. The overall conclusions are confirmed, and the plots are presented in Figure 5.IA and 6.IA.

[~ Insert Figure 5.IA about here ~]

[~ Insert Figure 6.IA about here ~]

Table 1.IA - Social Capital on Natural Capital – Instrumental Variables (using Mean Species Abundance as Proxy of Natural Capital)

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including three different measures of social capital: Avg. Referendum (column 1), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 5). Column 2 is estimated by IV with Blood donation as instrument for Avg. Referendum, column 4 is estimated by IV with Blood donation as instrument for Avg. Referendum (All) and column 6 is estimated by IV with Blood donation as instrument for Avg. Referendum (Excl.). Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance	(5) Mean Species Abundance	(6) Mean Species Abundance
Avg. Referendum	-213.611***	-375.996***				
	(0.000)	(0.002)				
Avg. Refer. (All)			-164.955***	-690.388		
			(0.000)	(0.360)		
Avg. Refer. (Excl.)					-159.369***	-551.669
					(0.000)	(0.248)
Geographic size	0.002**	0.001	0.003***	0.004	0.003***	0.004*
	(0.013)	(0.142)	(0.000)	(0.173)	(0.000)	(0.086)
Education	303.718***	454.860***	286.957***	909.913	291.548***	784.268
	(0.000)	(0.002)	(0.000)	(0.311)	(0.000)	(0.201)
Edu. squared	-16.021***	-24.217***	-15.181***	-48.408	-15.443***	-41.764
	(0.001)	(0.003)	(0.000)	(0.313)	(0.000)	(0.203)
Fertility	21.631	24.159	26.551	49.449	26.529	44.170
	(0.260)	(0.210)	(0.151)	(0.375)	(0.158)	(0.289)
Gender	-0.557	-2.413	0.739	-2.331	0.828	-1.328
	(0.883)	(0.595)	(0.841)	(0.811)	(0.823)	(0.863)
Civil Unions	1.595	2.986**	1.486	6.918	1.573	5.987
	(0.118)	(0.029)	(0.185)	(0.401)	(0.160)	(0.295)
Crime	-0.000*	-0.000	-0.000*	-0.000	-0.000*	-0.000
	(0.067)	(0.126)	(0.086)	(0.620)	(0.081)	(0.439)
Age	4.382***	6.367***	4.604***	11.196	4.579***	9.611
	(0.003)	(0.001)	(0.001)	(0.279)	(0.001)	(0.168)
GDPpercapita	0.776**	1.283**	0.585**	1.879	0.623**	1.714
	(0.025)	(0.013)	(0.039)	(0.316)	(0.032)	(0.210)
Constant	-1,527.96***	-2,159.871***	-1,549.732***	-4,439.407	-1,573.435***	-3,864.908
	(0.001)	(0.002)	(0.000)	(0.289)	(0.000)	(0.179)
Observations	94	94	103	103	103	103
R-squared	0.452	0.309	0.428		0.426	

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.IA - Social Capital, Education and Law Enforcement (using Mean Species Abundance as a Proxy of Natural Capital)

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). A measure of judiciary inefficiency and its square are included in the control variables. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
Blood donation	-0.234**			
	(0.014)			
Avg. Referendum		-217.280***		
		(0.000)		
Avg. Refer. (All)			-121.059***	
			(0.001)	
Avg. Refer. (Excl.)				-126.199***
				(0.000)
Judiciary ineff.	-33.664*	-35.366*	-17.164	-15.562
	(0.082)	(0.078)	(0.375)	(0.416)
Judiciary ineff. squared	12.161*	11.519	6.150	5.268
	(0.055)	(0.104)	(0.361)	(0.431)
GDPpercapita	0.467*	0.929***	0.675***	0.728***
	(0.051)	(0.002)	(0.006)	(0.004)
Education	155.603	270.399**	225.249**	235.739**
	(0.137)	(0.023)	(0.029)	(0.024)
Edu. squared	-8.408	-14.176**	-11.859**	-12.438**
	(0.147)	(0.030)	(0.036)	(0.030)
Age	-90.176**	-48.059	-69.353**	-68.679**
	(0.025)	(0.140)	(0.050)	(0.047)
Age squared	0.975**	0.550	0.774**	0.768**
	(0.024)	(0.119)	(0.042)	(0.039)
Income	-0.001	0.000	-0.000	-0.000
	(0.144)	(0.835)	(0.847)	(0.877)
Income squared	0.000	-0.000	-0.000	-0.000
	(0.334)	(0.405)	(0.782)	(0.742)
Constant	1,414.782	-102.400	566.003	503.470
	(0.152)	(0.915)	(0.542)	(0.582)
Observations	107	94	107	107
R-squared	0.232	0.445	0.317	0.331

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.IA - Social Capital on Natural Capital by Macroarea

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). Four geographic groups called "Macroareas" are included as control variables: North East, North West, Center and South. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
_IMACROAREA_2	-3.762	2.168	2.352	1.926
	(0.399)	(0.514)	(0.502)	(0.583)
_IMACROAREA_3	14.236***	9.310*	8.397	8.286
	(0.009)	(0.074)	(0.114)	(0.117)
_IMACROAREA_4	5.657	-6.034	-1.917	-3.027
	(0.282)	(0.332)	(0.716)	(0.576)
Blood donation	-0.236**			
	(0.014)			
Avg. Referendum		-208.589***		
		(0.000)		
Avg. Refer. (All)			-151.073***	
			(0.000)	
Avg. Refer. (Excl.)				-147.136***
				(0.000)
Geographic size	0.002***	0.002***	0.003***	0.003***
	(0.009)	(0.001)	(0.000)	(0.000)
Education	59.544	229.722***	218.505***	216.577***
	(0.505)	(0.006)	(0.006)	(0.006)
Edu. squared	-2.798	-11.928***	-11.376***	-11.295***
	(0.567)	(0.008)	(0.008)	(0.009)
Fertility	8.660	4.754	11.164	11.143
	(0.681)	(0.804)	(0.568)	(0.573)
Gender	0.531	2.611	2.871	3.079
	(0.887)	(0.531)	(0.454)	(0.423)
Civil Unions	-0.340	1.474	1.420	1.486
	(0.770)	(0.187)	(0.242)	(0.220)
Crime	-0.000***	-0.000**	-0.000**	-0.000**
	(0.002)	(0.015)	(0.034)	(0.030)
Age	1.394	1.888	2.715	2.607
	(0.412)	(0.266)	(0.119)	(0.134)
GDPpercapita	0.364	0.582*	0.443	0.462
	(0.220)	(0.060)	(0.119)	(0.108)
Constant	-390.021	-1,214.479***	-1,247.749***	-1,241.338***
	(0.421)	(0.010)	(0.006)	(0.006)
Observations	103	94	103	103
R-squared	0.330	0.498	0.457	0.457

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.IA - Social Capital and Law Enforcement Dummy (using Mean Species Abundance as a Proxy of Natural Capital)

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). Column 1 includes an interaction term called "I_Blood_Law" computed as multiplication of a dummy variable called "Efficient" and the measure of social capital "Blood donation". Column 2 includes an interaction term called "I_Avg.Ref_Law" computed as multiplication of a dummy variable called "Efficient" and the measure of social capital "Avg. Referendum". Column 3 includes an interaction term called "I_Avg.Ref_All_Law" computed as multiplication of a dummy variable called "Efficient" and the measure of social capital "Avg. Referendum (All)". Column 4 includes an interaction term called "I_Avg.Ref_Excl_Law" computed as multiplication of a dummy variable called "Efficient" and the measure of social capital "Avg. Referendum (Excl.)". The dummy "Efficient" takes value 1 if "Judiciary ineff." is lower than the median value across all the provinces. Variable descriptions are in Appendix A.

	(1)	(2)	(3)	(4)
VARIABLES	**Mean Species Abundance**	**Mean Species Abundance**	**Mean Species Abundance**	**Mean Species Abundance**
Blood donation	-0.152*			
	(0.067)			
I_Blood_Law	-0.167			
	(0.209)			
Avg. Referendum		-211.244***		
		(0.000)		
I_Avg.Ref_Law		-18.805**		
		(0.046)		
Avg. Refer. (All)			-112.028***	
			(0.002)	
I_Avg.Ref_All_Law			-15.172	
			(0.120)	
Avg. Refer. (Excl.)				-117.416***
				(0.001)
I_Avg.Ref_Excl_Law				-14.536
				(0.110)
GDPpercapita	0.464*	0.938***	0.686***	0.739***
	(0.050)	(0.001)	(0.004)	(0.003)
Judiciary ineff.	-50.351*	-66.240**	-40.275	-38.896
	(0.052)	(0.018)	(0.160)	(0.168)
Judiciary ineff. squared	16.488**	19.807**	12.253	11.447
	(0.036)	(0.026)	(0.168)	(0.192)
Education	190.057*	282.356**	226.014**	236.922**
	(0.080)	(0.015)	(0.026)	(0.021)
Edu. squared	-10.303*	-14.769**	-11.875**	-12.478**
	(0.087)	(0.020)	(0.033)	(0.027)
Age	-87.115**	-51.569	-70.778*	-69.965**
	(0.036)	(0.126)	(0.052)	(0.050)
Age squared	0.940**	0.585	0.787**	0.779**
	(0.035)	(0.109)	(0.045)	(0.042)
Income	-0.001	0.000	-0.000	-0.000
	(0.145)	(0.787)	(0.832)	(0.859)
Income squared	0.000	-0.000	-0.000	-0.000
	(0.310)	(0.361)	(0.800)	(0.760)
Constant	1,204.964	-50.393	616.297	548.920
	(0.249)	(0.958)	(0.509)	(0.551)
Observations	107	94	107	107
R-squared	0.244	0.474	0.334	0.348

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.IA - Social Capital and Education Dummy (using Mean Species Abundance as a Proxy of Natural Capital) – Interaction

This table reports OLS regression estimates with robust standard errors, pvalues in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). Column 1 includes an interaction term called "I_Blood_Edu" computed as multiplication of a dummy variable called "Lowedu" and the measure of social capital "Blood donation". Column 2 includes an interaction term called "I_Avg.Ref_Edu" computed as multiplication of a dummy variable called "Lowedu" and the measure of social capital "Avg. Referendum". Column 3 includes an interaction term called "I_Avg.Ref_All_Edu" computed as multiplication of a dummy variable called "Lowedu" and the measure of social capital "Avg. Referendum (All)". Column 4 includes an interaction term called "I_Avg.Ref_Excl_Edu" computed as multiplication of a dummy variable called "Lowedu" and the measure of social capital "Avg. Referendum (Excl.)". The dummy "Lowedu" takes value 1 if "Education" is lower than the median value across all the provinces. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
Blood donation	-0.176			
	(0.130)			
I_Blood_Edu	-0.044			
	(0.729)			
Avg. Referendum		-207.231***		
		(0.000)		
I_Avg.Ref_Edu		-1.595		
		(0.834)		
Avg. Refer. (All)			-121.511***	
			(0.000)	
I_Avg.Ref_All_Edu			1.168	
			(0.880)	
Avg. Refer. (Excl.)				-126.742***
				(0.000)
I_Avg.Ref_Excl_Edu				0.957
				(0.896)
GDPpercapita	0.411*	1.026***	0.727***	0.793***
	(0.053)	(0.001)	(0.003)	(0.002)
Education	145.524	291.402**	229.561**	233.661**
	(0.147)	(0.014)	(0.026)	(0.024)
Edu. squared	-7.907	-15.396**	-12.069**	-12.315**
	(0.157)	(0.019)	(0.036)	(0.033)
Age	-95.346**	-58.169*	-71.023**	-70.118**
	(0.014)	(0.062)	(0.033)	(0.032)
Age squared	1.034**	0.661**	0.792**	0.785**
	(0.012)	(0.050)	(0.027)	(0.025)
Income	-0.001	-0.000	-0.000	-0.000
	(0.172)	(1.000)	(0.792)	(0.842)
Income squared	0.000	-0.000	-0.000	-0.000
	(0.368)	(0.499)	(0.783)	(0.722)
Constant	1,558.063*	6.055	572.248	531.595
	(0.095)	(0.995)	(0.512)	(0.537)
Observations	110	94	110	110
R-squared	0.192	0.414	0.306	0.321

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6.IA - Social Capital and Law Enforcement (using Mean Species Abundance as a Proxy of Natural Capital) – Subsample Efficient

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). The results refer to the subsample of provinces with dummy "Efficient" equal to 1. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
Blood donation	-0.398*			
	(0.063)			
Avg. Referendum		-399.636***		
		(0.000)		
Avg. Refer. (All)			-181.849***	
			(0.004)	
Avg. Refer. (Excl.)				-196.102***
				(0.001)
Judiciary Ineff.	-329.431	-204.174	-251.614	-243.984
	(0.134)	(0.181)	(0.226)	(0.227)
Judiciary Ineff. squared	181.905	107.890	142.750	138.997
	(0.163)	(0.231)	(0.243)	(0.242)
GDPpercapita	0.598	1.368***	1.286**	1.397**
	(0.292)	(0.002)	(0.033)	(0.018)
Education	278.897	585.619***	259.384	264.249
	(0.163)	(0.001)	(0.273)	(0.236)
Edu. squared	-15.167	-31.164***	-13.913	-14.272
	(0.157)	(0.001)	(0.269)	(0.229)
Age	-172.016	-64.047	-90.325	-83.455
	(0.127)	(0.403)	(0.404)	(0.429)
Age squared	1.831	0.732	1.016	0.946
	(0.126)	(0.364)	(0.373)	(0.394)
Income	-0.001	0.001*	0.000	0.000
	(0.496)	(0.099)	(0.697)	(0.622)
Income squared	0.000	-0.000***	-0.000	-0.000
	(0.900)	(0.003)	(0.243)	(0.180)
Constant	2,930.773	-1,062.773	980.598	801.670
	(0.292)	(0.586)	(0.724)	(0.764)
Observations	53	46	53	53
R-squared	0.290	0.706	0.416	0.449

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7.IA - Social Capital and Law Enforcement (using Mean Species Abundance as a Proxy of Natural Capital) – Subsample Inefficient

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). The results refer to the subsample of provinces with dummy "Efficient" equal to 0. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
Blood donation	-0.154*			
	(0.056)			
Avg. Referendum		-65.512		
		(0.110)		
Avg. Refer. (All)			-55.575**	
			(0.037)	
Avg. Refer. (Excl.)				-52.150*
				(0.050)
Judiciary Ineff.	-17.178	-61.163	-21.835	-22.204
	(0.530)	(0.133)	(0.487)	(0.474)
Judiciary Ineff. squared	6.764	20.242*	7.201	7.251
	(0.371)	(0.087)	(0.430)	(0.421)
GDPpercapita	0.170	0.279	0.226	0.228
	(0.371)	(0.265)	(0.258)	(0.260)
Education	100.760	224.494*	177.387	169.926
	(0.446)	(0.076)	(0.191)	(0.209)
Edu. squared	-5.219	-11.972*	-9.325	-8.912
	(0.480)	(0.091)	(0.218)	(0.238)
Age	-59.077**	-58.498	-35.338	-38.071
	(0.049)	(0.147)	(0.241)	(0.206)
Age squared	0.656**	0.667	0.409	0.438
	(0.043)	(0.133)	(0.212)	(0.180)
Income	-0.001	-0.000	-0.000	-0.000
	(0.112)	(0.609)	(0.626)	(0.604)
Income squared	0.000	0.000	0.000	0.000
	(0.222)	(0.514)	(0.716)	(0.712)
Constant	888.633	329.339	-11.889	85.032
	(0.404)	(0.789)	(0.991)	(0.938)
Observations	54	48	54	54
R-squared	0.384	0.432	0.395	0.389

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8.IA - Social Capital and Education (using Mean Species Abundance as a Proxy of Natural Capital) – Subsample High

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). The results refer to the subsample of provinces with dummy "Lowedu" equal to 0. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
Blood donation	-0.150			
	(0.392)			
Avg. Referendum		-327.015***		
		(0.000)		
Avg. Refer. (All)			-118.837*	
			(0.072)	
Avg. Refer. (Excl.)				-128.160**
				(0.039)
Judiciary Ineff.	-80.734**	-47.069*	-61.166*	-57.537
	(0.037)	(0.078)	(0.094)	(0.112)
Judiciary Ineff. squared	32.320**	13.710	24.975*	23.307*
	(0.026)	(0.162)	(0.073)	(0.092)
GDPpercapita	0.591	0.960**	0.891*	0.931*
	(0.214)	(0.036)	(0.072)	(0.060)
Education	276.497	274.325	239.518	234.896
	(0.598)	(0.625)	(0.665)	(0.672)
Edu. squared	-14.742	-14.511	-12.767	-12.551
	(0.587)	(0.620)	(0.657)	(0.664)
Age	-150.389	-48.740	-112.301	-109.247
	(0.123)	(0.470)	(0.251)	(0.262)
Age squared	1.625	0.559	1.248	1.216
	(0.116)	(0.435)	(0.227)	(0.236)
Income	-0.001	0.000	-0.001	-0.001
	(0.196)	(0.807)	(0.429)	(0.460)
Income squared	0.000	-0.000	0.000	0.000
	(0.283)	(0.526)	(0.614)	(0.664)
Constant	2,252.283	-27.864	1,500.515	1,456.115
	(0.497)	(0.993)	(0.669)	(0.679)
Observations	55	51	55	55
R-squared	0.300	0.622	0.360	0.373

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9.IA - Social Capital and Education (using Mean Species Abundance as a Proxy of Natural Capital) – Subsample Low

This table reports OLS regression estimates with robust standard errors, p values in parenthesis, using Mean Species Abundance as dependent variable and a set of controls including four different measures of social capital: Blood donation (column 1), Avg. Referendum (column 2), Avg. Referendum (All) (column 3), Avg. Referendum (Excl.) (column 4). The results refer to the subsample of provinces with dummy "Lowedu" equal to 1. Variable descriptions are in Appendix A.

VARIABLES	(1) Mean Species Abundance	(2) Mean Species Abundance	(3) Mean Species Abundance	(4) Mean Species Abundance
Blood donation	-0.181*			
	(0.079)			
Avg. Referendum		-86.785		
		(0.105)		
Avg. Refer. (All)			-133.151***	
			(0.002)	
Avg. Refer. (Excl.)				-131.628***
				(0.003)
Judiciary Ineff.	-5.913	41.589*	7.768	9.180
	(0.823)	(0.098)	(0.716)	(0.662)
Judiciary Ineff. squared	2.602	-14.569	-3.094	-3.871
	(0.750)	(0.107)	(0.641)	(0.553)
GDPpercapita	0.410	0.668	0.688**	0.743**
	(0.169)	(0.160)	(0.045)	(0.043)
Education	230.168	636.574	252.219	293.006
	(0.621)	(0.196)	(0.547)	(0.468)
Edu. squared	-12.914	-35.805	-13.654	-15.992
	(0.627)	(0.203)	(0.569)	(0.489)
Age	-34.745	-15.199	-18.460	-21.242
	(0.429)	(0.779)	(0.639)	(0.590)
Age squared	0.391	0.194	0.236	0.266
	(0.415)	(0.745)	(0.583)	(0.537)
Income	-0.001	0.002	0.002*	0.002*
	(0.687)	(0.163)	(0.052)	(0.072)
Income squared	0.000	-0.000	-0.000*	-0.000*
	(0.746)	(0.154)	(0.059)	(0.081)
Constant	-224.293	-2,520.377	-751.491	-863.088
	(0.933)	(0.397)	(0.756)	(0.708)
Observations	52	43	52	52
R-squared	0.187	0.331	0.414	0.416

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10.IA - Summary Statistics by Industry Groups

This table reports summary statistics by industry groups. Industry dummies were created on percentage of total assets. Variable descriptions are in Appendix A.

Agriculture

	Mean	Median	SD	Min	Max	p25	p75	N
Mean Species Abundance	32.401	30.2	12.786	9.9	70.4	24	40.8	70
Bio Intactness Index	.865	.861	0.042	.789	.964	.835	.889	70
Deviation Natural Veg.	80.973	78.956	13.971	63.491	161.966	72.831	89.129	70
PCA Natural	33.653	32.363	7.364	23.296	59.646	28.813	36.772	70
Avg. Referendum	.524	.54	0.067	.381	.641	.475	.579	65
Avg. Refer. (All)	.512	.517	0.081	.28	.641	.457	.576	70
Avg. Refer. (Excl.)	.537	.548	0.086	.292	.676	.477	.607	70
Blood donation	30.49	28.546	17.781	0	90.902	16.933	41.795	70
GDPpercapita	33.355	33.217	10.594	4.978	66.011	25.025	41.427	70
GDPpercapita sq.	31.912	33.716	8.468	19.68	46.528	22.883	39.755	70

Production

Mean Species Abundance	38.341	37.5	20.749	11.3	89.4	23.2	51.5	29
Bio Intactness Index	.874	.871	0.057	.777	.979	.824	.914	29
Deviation Natural Veg.	79.519	79.479	12.057	52.945	105.507	71.264	88.461	29
PCA Natural	35.561	35.725	10.737	18.4	61.879	26.984	41.374	29
Avg. Referendum	.54	.559	0.062	.421	.633	.509	.576	23
Avg. Refer. (All)	.518	.546	0.071	.387	.633	.439	.573	29
Avg. Refer. (Excl.)	.546	.572	0.072	.412	.668	.485	.6	29
Blood donation	33.451	34.655	16.683	0	73.271	25.552	42.761	29
GDPpercapita	40.324	40.323	10.064	25.003	77.568	33.352	45.627	29
GDPpercapita sq.	36.855	39.395	7.320	21.103	45.342	33.924	43.281	29

Services

Mean Species Abundance	41.929	34.6	22.722	20.9	87.8	27.1	48.3	7
Bio Intactness Index	.879	.876	0.034	.825	.924	.853	.911	7
Deviation Natural Veg.	78.617	78.192	11.578	64.827	97.491	68.95	86.685	7
PCA Natural	36.707	33.786	11.576	26.129	59.206	27.589	41.235	7
Avg. Referendum	.561	.561	0.053	.474	.629	.543	.597	6
Avg. Refer. (All)	.542	.549	0.070	.427	.629	.474	.597	7
Avg. Refer. (Excl.)	.571	.578	0.070	.459	.661	.501	.624	7
Blood donation	34.722	36.893	15.772	8.798	53.092	24.626	47.359	7
GDPpercapita	45.481	43.382	7.540	34.717	54.025	40.571	53.707	7
GDPpercapita sq.	39.529	40.606	2.255	36.509	42.005	37.47	41.284	7

Table 11.IA – Experimental Design

This table reports DiD regression estimates with robust standard errors, p values in parenthesis, using two different measures of biodiversity as dependent variable: Mean Species Abundance (column 1), and Natural Capital (column 2). The dummy "Treated" takes value 1 if the province is Trento, and 0 if it is Belluno. The dummy "post" takes value 1 for the years from 2007 (included) when the "Legge Provinciale 27 luglio 2007, n. 13" (Social Policies in the Province of Trento) was passed. "Did" is the interaction term computed as multiplication of the dummy variables "Treated" and "Post". No additional control variables are included in this specification. Variable descriptions are in Appendix A.

	(1)	(2)
VARIABLES	**Mean Species Abundance**	**Natural Capital**
Did	-0.006***	-6.069**
	(0.000)	(0.027)
Treated	-0.011***	761.572***
	(0.000)	(0.000)
Post	-0.001***	-8.743***
	(0.003)	(0.000)
Constant	0.665***	1,057.827***
	(0.000)	(0.000)
Observations	58	58
R-squared	0.956	1.000

Robust p val in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure 1.IA – Comparison of Biodiversity across provinces

Chart of two measures of biodiversity (Natural Capital and Mean Species Abundance), for Trento and Belluno provinces from 1992 to 2020.

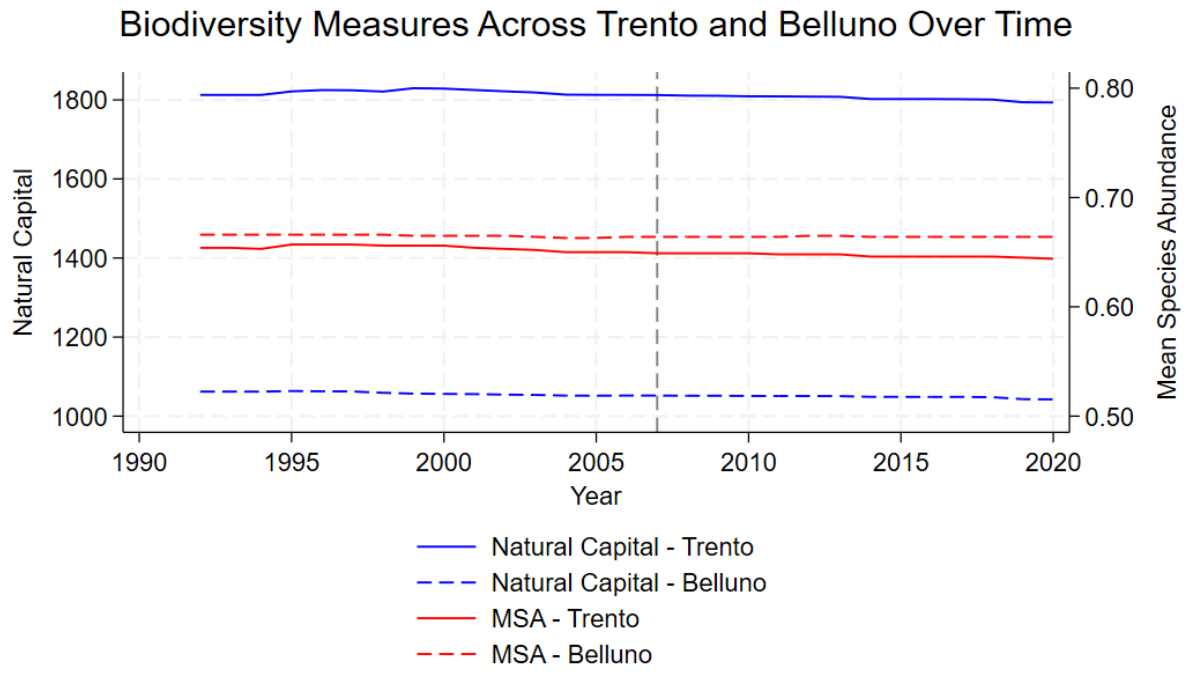


Figure 2.IA – Comparison of Social Capital across provinces

Chart of a Social Capital measure (attendance to Referendum), for Trento and Belluno provinces from 1992 to 2020 for available years.

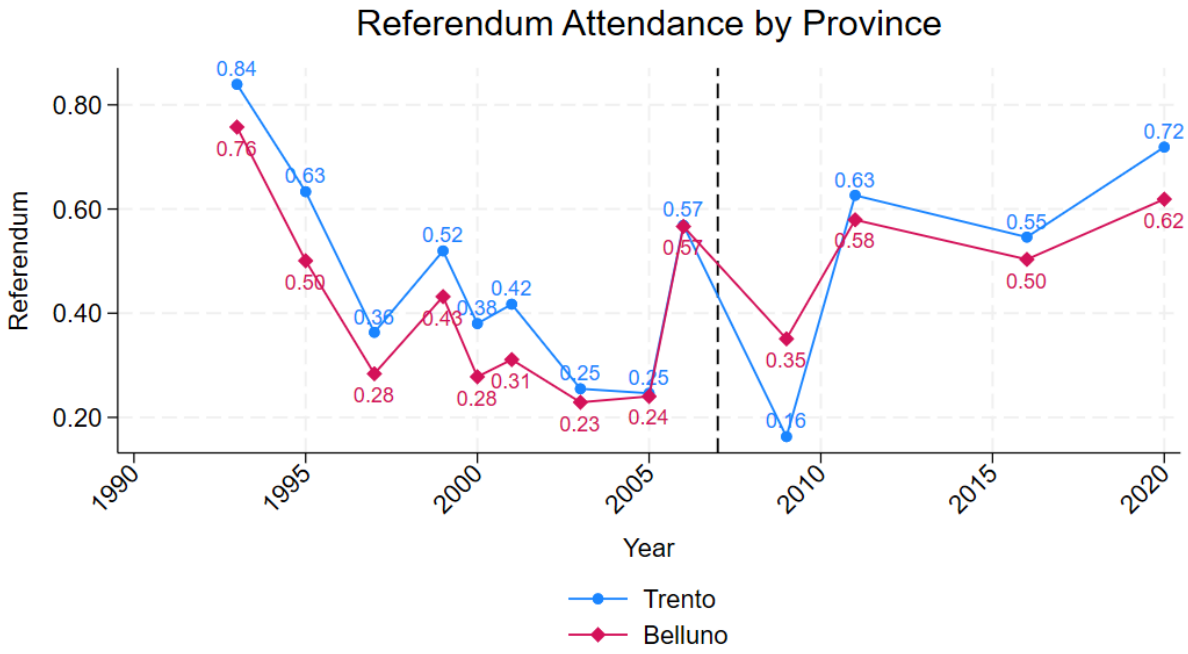


Figure 3.IA – Mean Species Abundance – event study – time window 1992/2020

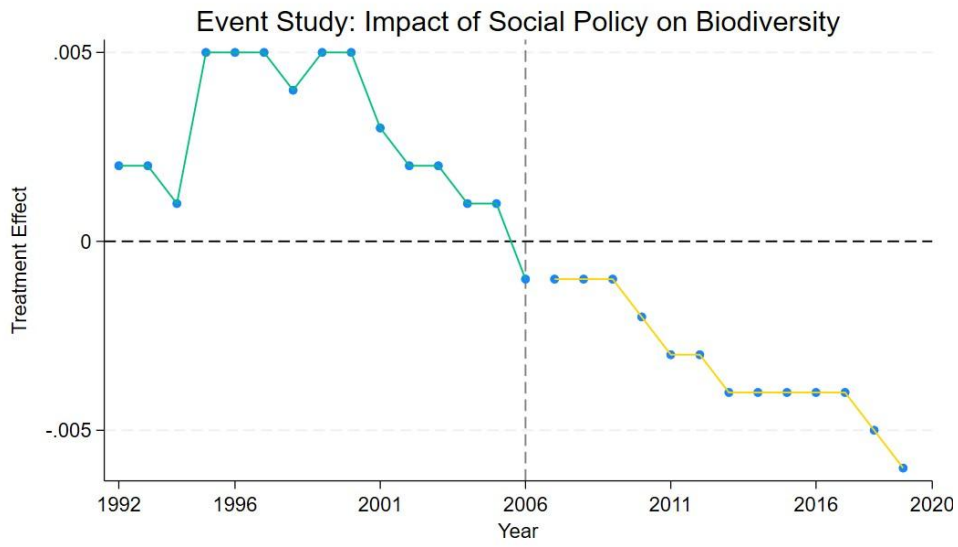


Figure 4.IA – Natural Capital – event study – time window 1992/2020

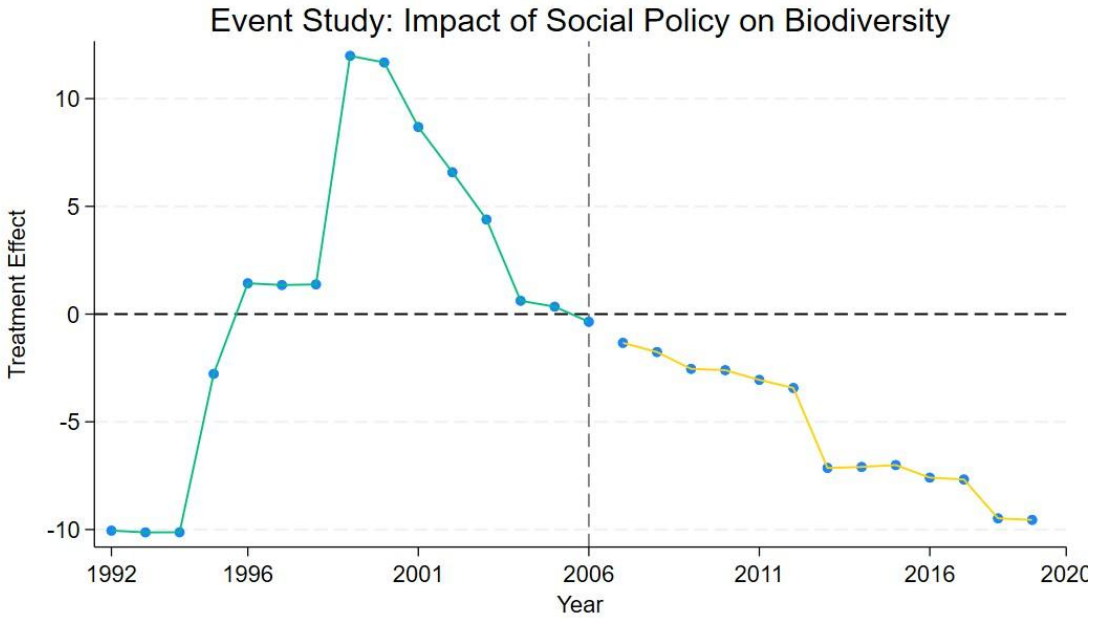


Figure 5.IA – Mean Species Abundance – event study – time window 2003/2010

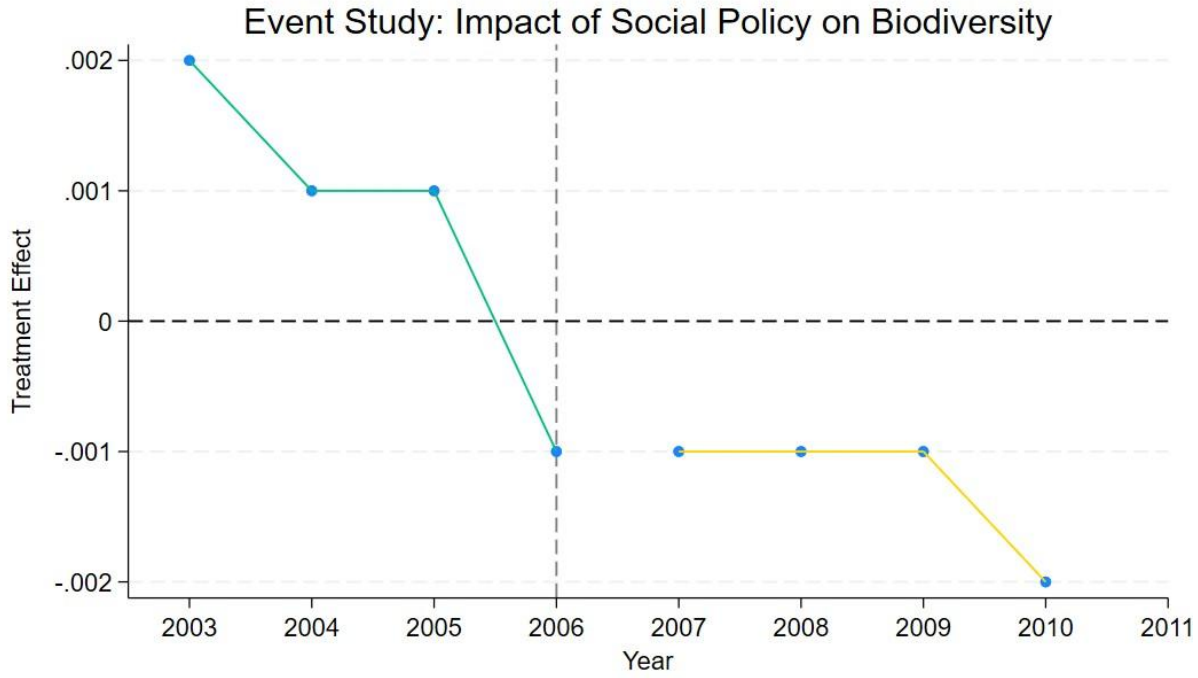


Figure 6.IA – Natural Capital – event study – time window 2003/2010

