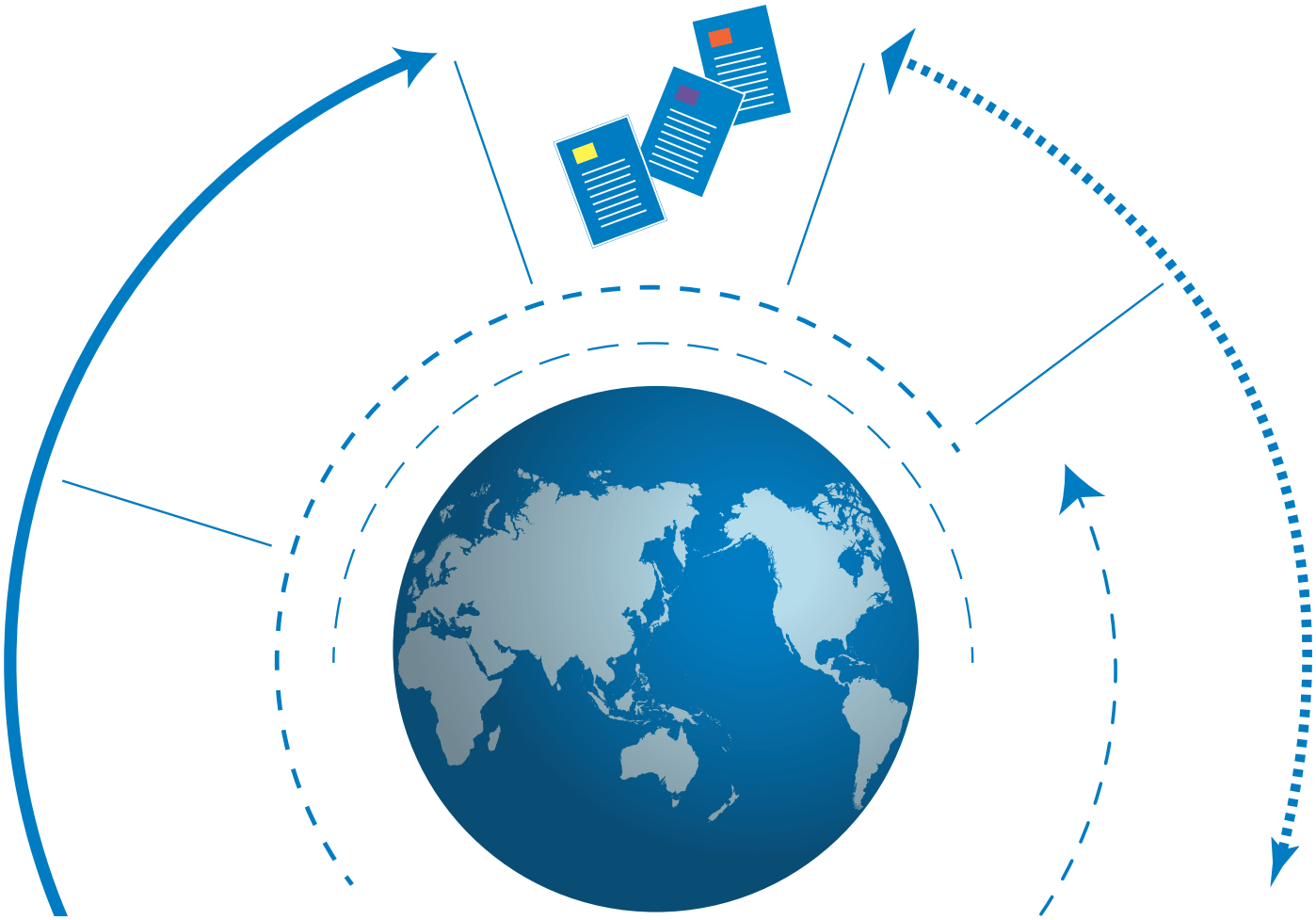
OECD DEVELOPMENT CENTRE

Working Paper No. 330

Research area: Perspectives on Global Development - Gender

Does gender discrimination in social institutions matter for long-term growth? Cross-country evidence

Gaëlle Ferrant and Alexandre Kolev



OECD DEVELOPMENT CENTRE

Authorised for publication by Mario Pezzini,
Director, OECD Development Centre

February 2016

DEVELOPMENT CENTRE WORKING PAPERS

This series of working papers is intended to disseminate the Development Centre's research findings rapidly among specialists in the field concerned. These papers are generally available in the original English or French, with a summary in the other language.

OECD Working Papers should not be reported as representing the official views of the OECD or of its member countries. The opinions expressed and arguments employed are those of the authors.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Working Papers describe preliminary results or research in progress by the author(s) and are published to stimulate discussion on a broad range of issues on which the OECD works. Comments on Working Papers are welcomed, and may be sent to the OECD Development Centre, 2 rue André Pascal, 75775 PARIS CEDEX 16, France; or to dev.contact@oecd.org. Documents may be downloaded from: www.oecd.org/dev/wp.

©OECD (2016)

Applications for permission to reproduce or translate all or part of this document should be sent to rights@oecd.org.

CENTRE DE DÉVELOPPEMENT DOCUMENTS DE TRAVAIL

Cette série de documents de travail a pour but de diffuser rapidement auprès des spécialistes dans les domaines concernés les résultats des travaux de recherche du Centre de développement. Ces documents ne sont disponibles que dans leur langue originale, anglais ou français ; un résumé du document est rédigé dans l'autre langue.

Les documents de travail de l'OCDE ne doivent pas être présentés comme exprimant les vues officielles de l'OCDE ou de ses pays membres. Les opinions exprimées et les arguments employés sont ceux des auteurs.

Ce document et toute carte qu'il peut comprendre sont sans préjudice du statut de tout territoire, de la souveraineté s'exerçant sur ce dernier, du tracé des frontières et limites internationales, et du nom de tout territoire, ville ou région.

Les documents de travail exposent des résultats préliminaires ou des travaux de recherche en cours menés par l'auteur/les auteurs et sont publiés pour stimuler le débat sur un large éventail de questions sur lesquelles l'OCDE travaille. Les commentaires sur les documents de travail sont bienvenus et peuvent être adressés au Centre de développement de l'OCDE, 2 rue André Pascal, 75775 PARIS CEDEX 16, France; ou à dev.contact@oecd.org. Les documents peuvent être téléchargés à partir de: www.oecd.org/dev/wp.

©OCDE (2016)

Les demandes d'autorisation de reproduction ou de traduction de tout ou partie de ce document devront être envoyées à rights@oecd.org.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS 4
PREFACE 5
RÉSUMÉ 6
ABSTRACT 7
I. INTRODUCTION 8
II. EMPIRICAL STRATEGY 11
III. DATA AND MEASUREMENT 16
IV. EMPIRICAL RESULTS 21
V. QUANTIFYING THE EFFECTS OF GENDER-BASED DISCRIMINATION IN SOCIAL INSTITUTIONS 28
VI. CONCLUSION 31
REFERENCES 32
ANNEXES 35
OTHER TITLES IN THE SERIES/ AUTRES TITRES DANS LA SÉRIE 45

© OECD 2016

ACKNOWLEDGEMENTS

The authors are indebted to Francesco Granella for his helpful research assistance, and thank Mario Pezzini, Federico Bonaglia, Fabrice Murtin, Olivier Thévenon, Carlotta Balestra, Eric Bensel, Balázs Egert, Juan de Laiglesia, Elsa Cruz de Cisneros (all from the OECD), and Stefan Klasen (Gottingen University) for their comments on the previous version of this paper.

© OECD 2016

PREFACE

Deeply entrenched discrimination in formal or informal laws, social norms or practices often poses significant and enduring obstacles for women in many rich or poor countries worldwide. By measuring these discriminatory social institutions in key areas that affect a woman's life, the Social Institutions and Gender Index (SIGI), produced by the Organisation for Economic Co-operation and Development's (OECD) Development Centre, has been instrumental in documenting the persistence and prevalence of gender discrimination across countries at different stages of development. The SIGI also has been used increasingly to explore the links between discriminatory social institutions and gender disparities in well-being outcomes.

What is equally important is exploring how — and through which channels — gender discrimination in social institutions may impact macro-economic indicators, such as long-term growth, beyond its effect on gender inequality in outcomes. Gender equality is not only a fundamental human right but also a critical economic challenge.

This paper explores the extent to which gender-based discrimination in social institutions measured by the SIGI matters for long-term growth. It contributes to the policy dialogue on inclusive growth through two key findings.

First, the paper shows that gender-based discrimination in social institutions impedes economic growth beyond its effect on gender inequality in outcomes. This negative influence appears stronger in low-income countries and seems to affect growth by lowering both female human capital acquisition and labour force participation, as well as total factor productivity.

Second, the paper finds that the income loss associated with current levels of gender discrimination could be substantial, estimated at up to USD 12 trillion, or 16% of current global GDP. At the same time, it shows that reducing gender-based discrimination in social institutions through the right policy measures could yield substantial economic benefits, leading to an annual increase in the world GDP growth rate of 0.03 to 0.6 percentage points by 2030, depending on the scenario.

These findings add to the work by the OECD Development Centre to better measure gender-based discrimination in social institutions and analyse the state of social cohesion in countries at different stages of development. We hope these findings will make the case for including policies and programmes that directly target discriminatory social institutions in national growth strategies, and as such, help countries identify ways to reach the ambitious targets of gender equality as Sustainable Development Goal 5 captures.

Mario Pezzini
Director
OECD Development Centre

© OECD 2016

RÉSUMÉ

Cet article évalue le gain de revenu potentiel associé à une plus grande parité entre les sexes dans les institutions sociales et le coût du niveau actuel de discrimination. À partir d'une analyse transversale, il examine comment les discriminations de genre dans les institutions sociales, mesurées par l'indicateur institutions sociales et égalité femme-homme de l'OCDE (SIGI), influencent la croissance économique de long terme. Les résultats indiquent tout d'abord que les institutions sociales discriminatoires entravent la croissance économique de long terme d'un pays au-delà de leurs effets sur les inégalités de genre en matière de résultats. Deuxièmement, cet effet est d'autant plus fort que les pays sont pauvres. Troisièmement, l'analyse des canaux de transmission suggère que les discriminations de genre dans les institutions sociales influencent la croissance de long-terme en restreignant l'accès des femmes à l'éducation et au marché du travail, ainsi qu'en réduisant la productivité totale des facteurs. Quatrièmement, le coût de la discrimination de genre dans les institutions sociales est estimé à une perte de revenu atteignant jusqu'à 12 milliards de dollars, soit 16 % du revenu mondial. Une diminution progressive des discriminations de genre dans les institutions sociales d'ici à 2030 pourrait augmenter les taux de croissance annuels mondiaux de 0.03 à 0.6 points de pourcentage pendant les 15 prochaines années, selon le scenario envisagé. Ces résultats sont robustes à des changements de spécifications et à l'utilisation de procédures d'estimations traitant des potentiels problèmes d'endogéneité.

Classification JEL: J16, O11, O43

Mots-clés: Institutions sociales, Inégalité de genre, Croissance, Revenu, Objectifs de développement durable.

© OECD 2016

ABSTRACT

This paper estimates the potential income gains associated with greater gender parity in social institutions and the cost of the current level of discrimination. Using cross-country analysis, it investigates how gender-based discrimination in social institutions, measured by the OECD Development Centre's Social Institutions and Gender Index (SIGI), affects income per capita. First, the empirical results indicate that such discrimination impedes a country's level of income beyond its effect on gender inequality in outcomes. Second, the effect is stronger for low-income countries. Third, the channel decomposition analysis indicates that gender-based discrimination in social institutions tends to reduce income per capita by lowering both women's human capital acquisition and labour force participation, as well as total factor productivity. Fourth, the income loss associated with gender discrimination in social institutions is estimated at up to USD 12 trillion, or 16% of world income. By contrast, a gradual dismantling of gender-based discriminatory social institutions by 2030 could increase the annual income global growth rate by 0.03 to 0.6 percentage points over the next 15 years, depending on the scenario. Such results are robust to changes in specifications and controls for potential endogeneity.

JEL Classification: J16, O11, O43

Keywords: Social institutions, Gender Inequality, Growth, Income, Sustainable Development Goals.

© OECD 2016

I. INTRODUCTION

Deeply entrenched discrimination in social institutions such as formal or informal laws, social norms or practices poses significant and enduring obstacles for women in many rich or poor countries worldwide. By measuring these discriminatory social institutions in key areas that affect a woman's life, the Social Institutions and Gender Index (SIGI), produced by the Organisation for Economic Co-operation and Development's (OECD) Development Centre, has been instrumental in documenting the persistence and prevalence of gender discrimination in social institutions across countries at different stages of development (OECD, 2014b). The SIGI also has been used increasingly to explore the links between discriminatory social institutions and gender disparities in well-being outcomes (Ferrant and Tuccio, 2015; Ferrant and Nowacka, 2015; Branisa, Klasen and Ziegler, 2013; Luci, Jütting and Morrisson, 2012). Research findings show that in addition to fulfilling fundamental human rights, addressing gender discrimination in social institutions is needed to improve individual outcomes for women and ultimately enhance the well-being of current and future generations (Ferrant and Nowacka, 2015).

Beyond the effect of gender inequality in outcomes, what is equally important is exploring the extent to which gender discrimination in social institutions may impact macro-economic indicators, such as long-term growth, and through which channels. If discriminatory social institutions are associated with lower levels of long-term growth, after accounting for the standard determinants of growth and gender differences in key socio-economic outcomes, then the case is strong for including policies and programmes that directly target discriminatory social institutions in national development strategies. Little is known, however, about the effect of gender-based discrimination in social institutions on economic growth.

While an expanding body of evidence shows how much gender equality in outcomes matter, the role of discriminatory social institutions has been neglected largely in the gender and growth literature. Growth theory suggests that the accumulation of labour, physical and human capital is the main determinant of economic development and that the return on these assets depends, in turn, on both technological progress and the efficiency of the institutional framework of production (Mankiw, Romer and Weil, 1992; Solow, 1956). But why did some societies manage to accumulate and innovate more rapidly than others? Other geographic, economic and institutional factors (Diamond and Guns, 1997; Sachs and Warner, 2001; Frankel and Romer, 1999; Rodrik, Subramanian and Trebbi, 2004) may explain why some countries have performed better and converged according to the Solow theory, while others continue to stagnate or even sink into poverty. The literature is moving towards explaining growth gaps between developed and poor countries by gender inequality (see Kabeer and Natali (2013) for a literature review). By influencing the way in which labour force, physical and human capital are generated, as well as technological progress and production efficiency, gender inequalities in education, but also in

 © OECD 2016

employment, business opportunities, savings, land, capital, and other productive assets, are expected to affect economic growth (Ferrant, 2015).

Empirically, the gender and growth literature investigating the effect of gender disparities on growth is well documented. However, existing studies are to a large extent confined to the effect of gender inequality in outcomes. Empirical work finds a positive association between gender parity in education and income per capita (Dollar and Gatti, 1999; Klasen, 2002; Thévenon and Salvi del Pero, 2015). For example, in OECD countries, a balanced gender ratio in education would increase income per capita by 0.8% in comparison to a scenario where women have no access to education (Thévenon and Salvi del Pero, 2015). In the same vein, gender gaps in education contribute to 28% of the difference in the annual growth rates between East Asia and South Asia (Klasen, 2002). Other studies find that gender inequalities in labour market outcomes hamper economic growth (Klasen and Lamanna, 2009; OECD, 2012; Cuberes and Teigner, 2013; Woetzel, J. et al. 2015). For example, gender gaps in labour markets lead to income losses of about 27% in the Middle East and North Africa and 19% in South Asia (Cuberes and Teigner, 2013). In the OECD area, it is estimated that income would increase by 12% if the female participation rates would reach male levels in 2030 (OECD, 2012). Some more recent studies have attempted to use broader measures of gender inequality in outcomes and find that gender disparities not only in education but also in other areas such as health, employment and political participation have an adverse effect on economic growth (Amin, Kuntchev and Schmidt, 2015; Ferrant, 2015).

By guiding male and female behaviours and shaping gender interactions, discriminatory social institutions are additional key issues for economic growth. Social institutions are a major factor influencing development outcomes (Morrison and Jütting, 2005; Branisa, Klasen and Ziegler, 2013): they set the parameters of what decisions, choices or behaviours are deemed acceptable or unacceptable in a society and therefore define and influence gender roles and relations. Through their influence on the unequal distribution of power between men and women in the private sphere of the family, in the economic sphere and in public life, discriminatory social institutions constrain the women's economic opportunities. In turn, restricted women's access to education and labour has substantial negative consequences on economic growth, by reducing factor accumulation and their productivity (Klasen, 2002; Klasen and Lamanna, 2009).

This paper focuses primarily on the roots causes of gender inequality on income. Using the SIGI and cross-sectional data for 108 countries, it assesses the relationship between gender-based discrimination in social institutions and income per capita. This paper contributes to the literature on gender inequality and growth in four important ways. First, it provides new evidence on the negative role of gender-based discrimination in social institutions on national income, extending the current analyses of gender disparities in outcomes and growth. Second, it explores the strength of the relationship between gender discrimination in social institutions and national income with the level of economic development. Third, this paper introduces channel decomposition analysis of growth to identify possible channels of transmission through the labour force, human capital acquisition, physical capital accumulation and/or total factor

© OECD 2016

productivity. Finally, it provides new estimates of the economic costs of gender discrimination in social institutions as well as measures of the potential economic gains that countries could achieve by reducing levels of gender-based discrimination in social institutions.

The paper is organised as follows: Section II introduces the empirical strategy and addresses methodological issues. Data and descriptive statistics are presented in Section III. Empirical results from the growth models and the channel decomposition analysis are discussed in Section IV. Estimates of the economic costs of gender-based discriminatory institutions and measures of economic gains based on different scenarios are discussed in Section V. Section VI concludes with some policy implications and directions for future research.

© OECD 2016

II. EMPIRICAL STRATEGY

The empirical analysis provides an attempt to link countries' levels of gender-based discrimination in social institutions[1] with long-term growth.[2] It tests three hypotheses:

i) Gender-based discrimination in social institutions reduces countries' levels of income by creating growth bottlenecks restricting women's economic opportunities.

ii) The loss of income associated with discriminatory social institutions is higher for low-income countries facing other growth bottlenecks that reinforce each other.

iii) Gender-based discrimination in social institutions affects countries' income by influencing the level of labour force participation, physical capital and human capital as well as their ability to innovate.

The growth accounting framework

The macroeconomic growth literature identifies both factor accumulation and total factor productivity as the determinants of economic growth. In this paper, we investigate the direct impact of gender-based discrimination in social institutions on income, as well as its indirect contribution through its influence on these determinants. The empirical analysis assumes that the relationship between output and resources can be summarized by an aggregate production function. Following Mankiw, Romer and Weil (1992) a human capital-augmented Solow model of economic growth is used. Let the production (Y) be a function of the level of technology (total factor productivity, TFP), the stock of human (H) and physical (K) capital, as well as the labour force (L):

$$Y = f(TFP, H, K, L) \qquad (1)$$

1. Following Krueger and Lindahl (2001), one may assume that not only the level of gender-based discrimination in social institutions affects long-term growth but also its variation. However, given the nature of the SIGI data, this paper focuses on the effect of the discrimination level.

2. More precisely, the empirical strategy assesses the relationship between gender-based discrimination in social institutions and income per capita. Indeed, the level of income per capita is a good proxy for long-term growth because until 1750 there were only minor differences in income per capita across countries (Acemoglu, Robinson and Johnson, 2002). However, for the sake of clarity, the term income instead of long-term growth will be used hereafter.

© OECD 2016

The empirical model

The analysis considers both the total and indirect effects of gender-based discrimination in social institutions on income. Thus, a set of equations is estimated to capture both types of effect:

$$TFP_i = \alpha_0 + \alpha_1 SIGI_i + \alpha_2 \boldsymbol{x}_i + \eta_i \quad (2)$$
$$H_i = \delta_0 + \delta_1 SIGI_i + \delta_2 \boldsymbol{x}_i + \mu_i \quad (3)$$
$$K_i = \rho_0 + \rho_1 SIGI_i + \rho_2 \boldsymbol{x}_i + \tau_i \quad (4)$$
$$L_i = \beta_0 + \beta_1 SIGI_i + \beta_2 \boldsymbol{x}_i + \varepsilon_i \quad (5)$$
$$y_i = \gamma_0 + \gamma_1 SIGI_i + \gamma_2 \boldsymbol{x}_i + \varphi_i \quad (6)$$

In these equations, y_i is the income per capita for country *i*, *SIGI* is the interest variable measuring the level of gender-based discrimination in social institutions in country *i*, *TFP* measures total factor productivity, *H* and *K* measure respectively human and physical capital accumulation and *L* measures the labour force. $\boldsymbol{x}$ is a vector of control variables typically included in cross-country income regressions including the deep determinants of growth, such as the convergence terms (initial GDP level or income groups in 2000), geography (latitude and landlocked), institutions (rule of law and civil liberties), population size and trade openness; additional controls (inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, government expenditure in education, unemployment rates, share of female teacher and the level of education); gender gaps in outcomes, such as labour force participation, health and education; and regional dummy variables (See Table 1 for a complete list of variables). Finally, $\eta, \mu, \tau, \varepsilon$ and φ stand for the error terms.

The two first objectives are to (i) estimate the income loss associated with discriminatory social institutions and (ii) identify channels of transmission through which gender-based discrimination in social institutions indirectly affect a country's income level. Since gender bias in social institutions may affect total factor productivity, labour force, human and physical capital accumulation,[3] equations 2-5 measure indirect effects that discriminatory social institutions have on income. Combining the growth accounting framework (equation 1) with the equations of the indirect effect of gender-based discrimination in social institutions on income (equations 2-5) yields an equation for income as a function of the SIGI (equation 6). Hence, equation 6 is a reduced form regression that omits total factor productivity, labour force, human and physical capital accumulation. This equation measures the total effect of gender-based discrimination in social institutions on income and is used to estimate the income loss associated with discriminatory social institutions.

We further explore whether the effect of gender-based discrimination in social institutions on human capital and the labour force is driven by female inputs. Male and female human capital and labour force may be considered as separate factors of production (Knowles, Lorgelly and Owen, 2002; Klasen and Lammanna, 2009). One may also assume that gender-based discrimination in social institutions lowers the stock of human capital and the labour force by

3. See DFID (2008) for more information on the link between gender equality and the growth determinants.

© OECD 2016

restricting women's access to education and the labour market (Branisa et al., 2009). These assumptions are tested using equations 7 and 8 separately for males (*m*) and females (*f*):

$$H_{i,j} = \delta_{j,0} + \delta_{j,1}\, SIGI_i + \delta_{j,2}\, \boldsymbol{x}_i + \mu_{i,j} \quad (7)$$

$$L_{i,j} = \beta_{j,0} + \beta_{j,1}\, SIGI_i + \beta_{j,2}\, \boldsymbol{x}_i + \varepsilon_{i,j} \quad (8)$$

where $j = f, m$.

The third objective is to assess the heterogeneity of the link between gender-based discrimination in social institutions and income. This empirical analysis tests whether the strength of the relationship between gender-based discrimination in social institutions and income may vary with the country's level of economic development. To estimate such heterogeneity, two empirical strategies were used. First, equation 6 is estimated using quintile regression methods: the SIGI coefficient is estimated for the median, the top and bottom quartiles. Second, interaction terms between the SIGI and income groups have been introduced in equation 9.[4] Countries have been divided in three groups: low-, middle- and high-income.[5]

$$y_i = \alpha + \beta_1\, SIGI_i + \beta_2\, [SIGI_i * Income\ Group_i] + \beta_3\, \boldsymbol{x}_i + \zeta_i \quad (9)$$

The econometric strategy

The methodology used for the empirical analysis rests on a linear cross-country approach and exploits variation across 108 countries using both ordinary least squares (OLS) and two-stage least-squares (2SLS) estimators. To eliminate annual fluctuations of income, three years-average values of income per capita are used.

We start by estimating equations 2-8 relying on the OLS estimator. Given the heteroskedasticity problems frequently encountered with cross-sectional data, while the assumption of homoscedasticity is central for linear regression models such as OLS, the robust standard errors have been obtained with White's variance-covariance matrix in all regressions. Moreover, given the use of the OLS estimator assuming linearity of the parameters, using a log specification is more consistent. Indeed, this is useful when the relationship is nonlinear in parameters (as assumed by this paper and by the use of both quintile regressions and interaction terms) because the log-transformation generates the desired linearity in parameters for using OLS estimators.

4. The two methods are complementary. While the first method (the quintile regression) assumes that the coefficient of all income determinants could vary by quartiles, the second method (interaction term) allows only the SIGI coefficient to vary across income groups *ceteris paribus*.

5. We use 2014 income groups from the World Bank, which classify economies according to 2013 GNI per capita using the World Bank Atlas method. The groups are defined as follows: low-income, USD 1 045 or less; lower middle-income, between USD 1 045 and USD 4 125; upper middle-income, between USD 4 125 and USD 12 746; and high-income at USD 12 746 or more.

Possible endogeneity of the SIGI and its sub-indices should be taken into account when interpreting the coefficients. OLS regressions will give results that do not correspond to the causal effect of discriminatory social institutions on economic outcomes: upward or downward biases are possible. Hence, we interpret our results as robust correlates. Given the cross sectional nature of the data, we acknowledge that reverse causality (or simultaneity), measurement error, as well as omitted variables may bias our results, which leads us to make a number of adjustments. Endogenity concerns are reduced in three ways. First, using lagged value of the SIGI reduces reverse causality from the dependent variable to the interest variable.[6] Second, the omitted variable bias is reduced by including three sets of control variables (deep determinants, additional controls and gender gaps in outcomes) that could be correlated with income per capita and/or discriminatory social institutions. This allows minimising spurious correlation with our main results and assuring the SIGI is not capturing another phenomenon. However, because of the limited number of observations, the main constraint is degrees of freedom. To reduce multicollinearity issues, some additional controls highly correlated with the interest variable, such as initial levels of income to control for convergence,[7] have been excluded from the main results; moreover, the three sets of control variables are introduced one by one. Third, using interaction terms could be considered equivalent to a difference-in-difference estimation exercise that is a version of fixed effects suffering less from the omitted variable bias problem.

We then estimate equations 2-8 using the two-stage least-squares (2SLS) estimator. 2SLS uses instrumental variables and allows better control for endogeneity. Finding valid and relevant instruments when analysing gender inequalities can be a challenge, however (Klasen and Lamanna, 2009). The instruments must be uncorrelated with the error term in the explanatory equation, have no direct effect on income but be correlated with the endogenous independent variables (in our case the SIGI). What is an appropriate instrument remains very much debated in the growth and gender literature and this is why previous studies rarely shed light on the validity of the instruments to solve endogeneity issues. Dollar and Gatti (1999) use religious affiliation and civil liberties as instruments for gender inequality in a growth equation. However, some doubts have been raised regarding the exogeneity of such instruments, as they indeed appear to be associated with economic growth (Taylor, 1998; Sachs and Warner, 2001; Klasen, 2002). Klasen (2002) uses the fertility rate in 1960, its growth and government spending on education to instrument gender gaps in education. Other growth studies rely on institutional variables as potential instruments, such as countries' legal origin (Acemoglu and Johnson, 2005),

6. It seems somewhat implausible that gender-based discrimination in social institutions has a contemporaneous effect on economic development. This paper assumes that this influence should operate with a lag. Yet, since the SIGI measures discrimination in 2005-10, this paper uses 2009-11 income as a dependent variable.

7. Standard econometrics growth models include initial GDP per capita as a convergence parameter. However, the high correlation between the SIGI and GDP in 2000 led to a trade-off between giving valid results about SIGI as an individual predictor, i.e. reducing multicollinearity and controlling for convergence. A compromise was to use dummy variables indicating to which income group the country belonged to in 2000 as convergence parameters in the main regressions; and present the results using the GDP in 2000 as robustness checks. We acknowledge this may lead to overestimated coefficients.

© OECD 2016

the rule of law (Dollar and Gatti, 1999) or countries' ratification of the statutes governing the International Criminal Court (Aichele and Felbermayr, 2013).

Following Ferrant (2015) and Ferrant and Tuccio (2015), the two instruments used in this paper to predict the SIGI are the country's ratification date of the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) and the percentage of respondents declaring that men are better political leaders than women. This paper assumes that SIGI's instruments, Z, are key determinants of gender-based discrimination in social institutions (Cov(SIGI, Z)≠0) but have no direct effect on income per capita (Cov(Z, ε_i)=0). The two instruments appear to be valid: no evidence exists that richer countries ratify the CEDAW before poorer ones, nor that attitude towards female political leadership is linked to income level. Moreover, the two instruments seem to be good predictors of levels of discrimination in social institutions.[8]

8. Early ratification can be considered as greater sensitivity to gender issues and greater involvement in tackling discriminatory laws, decreasing the SIGI. Countries ratifying the CEDAW recognise the legitimacy of reducing gender discrimination and commit themselves to undertake a series of measures to end discrimination against women in all forms. This includes incorporating the principle of gender equality in their legal system, abolishing all discriminatory laws and enacting appropriate laws prohibiting discrimination against women; establishing tribunals and other public institutions to ensure the effective protection of women against discrimination; and ensuring elimination of all acts of discrimination against women by persons, organisations or enterprises. The SIGI score also mirrors citizen attitudes towards gender discrimination: positive attitudes towards female political leadership can be seen as norms favourable to gender equality, decreasing the SIGI. Government commitment, through new laws or new programmes raising awareness, induces change in attitudes towards gender inequality. The level of discriminatory norms and attitudes, as well as the prevalence of discriminatory practices, will also depend on their legality. New legislation and incentives, in turn, influence informal laws and social norms, as well as attitudes towards gender discrimination, regardless of the level of development of a country.

III. DATA AND MEASUREMENT

This section briefly describes the SIGI, as well as data on income per capita, total factor productivity, physical and human capital. All data sources and definitions are presented in Table 1. Then, Table 2 presents descriptive statistics for the background data used in the multivariate analysis.

The Social Institutions and Gender Index (SIGI)

To measure a country's level of discrimination in social institutions, this paper relies on the last edition of the SIGI (OECD, 2014b). The SIGI is a composite index that measures gender-based discrimination in social institutions taking into account formal and informal laws as well as attitudes and practices that discriminate against women in five dimensions: discriminatory family code, restricted physical integrity, son bias, restricted resources and assets, and restricted civil liberties.[9] The SIGI takes into account *de jure* (legal) as well as *de facto* (actual) situations. As such, it offers several advantages over other measures of social institutions, such as Women Business and Law (World Bank, 2015) or the CIRI women's right measures (Cingranelli and Richards, 2010) that focus only on the *de jure* situation. Legal systems might reflect a level of public commitment without illustrating the implementation of anti-discriminatory laws. Consequently, attitudinal and prevalence data are critical to mirror socially transformative changes (Harper et al., 2014).

The last edition of the SIGI quantifies the level of gender-based discrimination in social institutions in the period 2005-2010 for 108 countries. The SIGI is composed of 14 variables grouped into five sub-indices. It is an average of the squares of its five sub-indices (equation 10). It ranges from 0, indicating very low levels of discrimination, to 1, indicating very high levels of discrimination.

$$SIGI = \frac{1}{5}\,Discriminatory\ family\ code^2 + \frac{1}{5}\,Restricted\ physical\ integrity^2 + \frac{1}{5}\,Son\ preference^2 + \frac{1}{5}\,Restricted\ resources\ and\ assets^2 + \frac{1}{5}\,Restricted\ civil\ liberties^2 \qquad (10)$$

9. For more information on the construction of the index and its sub-indices, please refer to Branisa et al. (2014) or to the 2014 SIGI methodological paper available at www.oecd.org/dev/development-gender/gender-publications.htm.

© OECD 2016

Table 1. **Variable names, descriptions and data sources**

Variable	Description	Source
SIGI	The Social Institutions and Gender Index. Higher values indicate higher levels of discrimination.	GID-DB (OECD, 2014a)
Income	Expenditure-side real GDP per capita at current PPPs (in 2005 USD million). Three-years average (2009-11).	PWT 8.1 (Feenstra et al., 2015)
Convergence	Expenditure-side real GDP per capita at current PPPs (in 2005 USD million) in 2000 or income group in 2000.	
Physical capital	Capital stock per capita. Three-years average (2009-11).	
Human capital	Index of human capital per person, computed using average years of schooling and returns to education. Three-years average (2009-11).	
TFP	Total factor productivity. Three-years average (2009-11).	
Population size	Total population (in millions). Three-years average (2009-11).	
Latitude	Distance from the equator in degrees.	CEPII (2014)
Landlocked	Dummy variable equal to 1 if the country is landlocked.	
Rule of law	An index measuring the strength of the rule of law. Higher values indicate greater strength (2009).	WGI (World Bank, 2014a)
Civil Liberty	The Civil Liberties index measuring the freedoms of expression, assembly, association and religion. Higher values indicate less freedom (2009).	Freedom House (2014)
Ethnic	A measure of ethnic fractionalisation.	Alesina et al. (2003)
Religious	A measure of religious fractionalisation.	
Labour	Labour force participation (% of working-age population). Three-years average (2009-2011).	WDI (World Bank, 2014b)
Openness	Exports plus imports (% of GDP). Three-years average (2009-11).	
Oil production	Oil rents (% of GDP). Three-years average (2009-11).	
Natural resources	Total natural resources rents (% of GDP). Three-years average (2009-11).	
Inflation	Annual GDP deflator (%). Three-years average (2009-11).	
Urbanisation	People living in urban areas (% of total population). Three-years average (2009-11).	
Life expectancy	Life expectancy at birth in years (2009).	
Fertility rate	Number of births per woman (2009).	
Expenditures in education	Total government expenditure on education (% of GDP). Three-years average (2009-11).	
Female teacher	Share of female teacher (% of the total number of teachers). Three-years average (2009-11).	
Unemployment	Share of the labour force that is without work but available for and seeking employment (% labour force). Three-years average (2009-11).	
Gender gap in LFP	Female to male ratio of labour force participation (LFP) rates. Three-years average (2009-11).	
Income group	Dummy variable equal to 1 if the country belongs to the income group.	
GII	Gender Inequality Index measures gender inequalities in reproductive health, empowerment and economic status. The higher the value the more disparities between females and males (2010).	UNDP (2015)
Education	Total, female or male average years of schooling attained. Three-years average (2009-11).	Barro and Lee (2010)
Gender gap in education	Female to male ratio of average years of schooling attained. Three-years average (2009-11).	
CEDAW	Year of ratification of the Convention on the Elimination of All Forms of Discrimination against Women.	CEDAW (UN, 2016)
Attitudes	Percentage of respondents agreeing that men make better political leaders (2009).	World Value Survey (2014)

Note: GID-DB refers to the Gender, Institutions and Development Database; WGI to Worldwide Governance Indicators; WDI to World Development Indicators; PWT to Penn World Table and CEPII to Centre d'études prospectives et d'informations internationals..

Measuring long-term growth and growth channels

As most empirical studies on growth, this paper uses the Penn World Table 8.1 (PWT) for data on income, total factor productivity, human and physical capital, and the World Development Indicators (WDI) for data on the labour force.[10] Long-term growth is measured by 2009-11 income per capita, using constant GDP per capita at current PPP (in 2005 USD). The level of income per capita is a good proxy for long-term growth because until the 18th century there were only minor differences in income per capita across countries (Acemoglu, Robinson and Johnson, 2002). Income data from the WDI also are used in alternative specifications to check the robustness of our results to the choice of income data sources, as the use of different income estimates may affect the results (Ciccone and Jarociński, 2010).[11]

PWT data benefit from recent methodological improvements. First, the new measure of capital stock takes into account the differences in asset composition across countries and over time, and gives more accurate comparable capital levels across countries. This improvement is particularly important for low income countries since the new estimates lead to higher capital levels because the relatively cheaper structures have a larger weight in the relative price level of capital (Feenstra, Inklaar and Timmer, 2013). Similarly, the innovative measure of human capital combines average years of schooling from Barro and Lee (2010) and an assumed rate of return based on Psacharopoulos(1994).[12] Last, instead of considering total factor productivity (TFP) as the residual of growth regressions, PWT introduces for the first time data on TFP that is built on the new estimates of capital stock as well as labour inputs. Productivity is a measure of output divided by a measure of input (see Feenstra et al., 2013 for a detailed description of the measure). As for income, three-years averages (2009-11) also are used for total factor productivity, labour force, human and physical capital accumulation to reduce the impact of short-run variations.

Descriptive statistics

Table 2 provides descriptive statistics for key variables of interest by world regions. Large regional disparities in the degree of discrimination occur around the world:[13] the SIGI score

10. Standard econometrics growth models show that the size and quality of the labour force are important inputs for growth. The quality of the labour force is traditionally captured by the stock of human capital and TFP, while the size is proxied either by the employment rate or the labour force participation rate. In this paper, we use labour force data as they have broader country coverage than employment data.

11. Differences between estimates in the World Bank's World Development Indicators 2004 (WDI) and the PWT are limited, however. For example, the correlation between 2009-11 income in the PWT and the WDI is 95% (significant at 1% level).

12. Unfortunately, this variable is not sex-disaggregated. Hence, equations (7) and (8) use female and male average years of schooling as proxy for human capital.

13. The SIGI score varies between 0.0016 in Belgium and 0.5634 in Yemen. The standard deviation (0.1437) describes a wide range in the degree of gender inequality between the countries considered. Countries in the SIGI are classified in five groups according to their levels of gender-based discrimination in social

© OECD 2016

varies between an average of 0.0224 in OECD countries and 0.3220 in the Middle East and North Africa (MENA) region.[14] Table 2 further points to the persistence of a massive income gap between developed and least-developed countries.[15] The income per capita of the OECD countries (USD 26 400) included in our sample is almost four times the world average of USD 6 900. Eastern Europe and Central Asia (EECA) represents the second richest region, with about USD 8 700; followed by Latin America and the Caribbean (LAC) (USD 8 000). In contrast, South Asia (SA) and sub-Saharan Africa (SSA) are located at the bottom of the income distribution (USD 3 400 and USD 2 600, respectively).

Data on physical and human capital accumulation, labour force, and technological change, which are used in the growth decomposition analysis, are also depicted in Table 2. Regional income gaps can be analysed in parallel with regional differences in assets and productivity. First, levels of human capital track regional income levels well. The world's richest regions (OECD, EECA and LAC) have the highest levels of human capital (with a human capital index ranging from 2.6 to 3.0) and high educational attainment (people is these regions spend nine years in school on average). Second, capital stock per capita is lowest in regions located at the bottom of the world's income distribution (USD 9 100 in SA and USD 8 100 in SSA), while top income regions have the highest accumulation of physical capital (USD 11 500 in OECD). Third, labour force participation varies widely across regions: only 49% of the working age population is active in MENA compared to 72% in EAP and SSA countries. Finally, technology disparities are also a key driver of income disparities across regions: TFP is almost double in OECD and MENA countries than in SA and SSA.

---

institutions: very low (SIGI<0.04), low (0.04<SIGI<0.12), medium (0.12<SIGI<0.22), high (0.22<SIGI<0.35), and very high (SIGI> 0.35).

14. Regions are defined as follows: East Asia and Pacific (EAP) includes Cambodia, Indonesia, Lao People's Democratic Republic, Mongolia, Myanmar, People's Republic of China, Philippines, Thailand, Timor-Leste and Viet Nam; Eastern Europe and Central Asia (EECA) includes Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Former Yugoslav Republic of Macedonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Republic of Moldova, Romania, Serbia, Tajikistan, Ukraine and Uzbekistan; Latin America and the Caribbean (LAC) includes Argentina, Bolivarian Republic of Venezuela, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Plurinational State of Bolivia, and Trinidad and Tobago; OECD includes Belgium, Czech Republic, France, Italy, Slovenia, Spain, Turkey; Middle East and North Africa (MENA) includes Egypt, Iraq, Jordan, Lebanon, Morocco, Syrian Arab Republic, Tunisia and Yemen; South Asia (SA) includes Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka; and sub-Saharan Africa (SSA) includes Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.

15. In 2011, the Democratic Republic of the Congo had a GDP per capita in purchasing power parity (PPP) terms of USD 400, compared to Belgium, which recorded USD 35 000 per capita.

Table 2. **Descriptive statistics**

Variable	EAP	EECA	LAC	MENA	OECD	SA	SSA
SIGI	0.1528	0.1144	0.0695	0.3220	0.0224	0.2722	0.2842
	(0.0815)	(0.0791)	(0.0456)	(0.1440)	(0.0368)	(0.0928)	(0.1333)
Income per capita (USD)	5012	8736	7983	6465	26408	3387	2580
	(2549)	(4493)	(4538)	(3895)	(6830)	(1877)	(3226)
Physical capital	9.6	10.1	9.7	9.7	11.5	9.1	8.1
	(0.7)	(0.7)	(0.8)	(0.8)	(0.5)	(0.7)	(0.9)
Human capital	2.3	2.9	2.6	2.1	3.0	2.2	1.9
	(0.3)	(0.1)	(0.3)	(0.4)	(0.3)	(0.6)	(0.4)
Labour force participation (%)	0.72	0.65	0.69	0.49	0.69	0.65	0.72
	(0.14)	(0.07)	(0.04)	(0.04)	(0.04)	(0.13)	(0.11)
TFP	0.4	0.5	0.6	0.7	0.8	0.4	0.4
	(0.03)	(0.14)	(0.31)	(0.18)	(0.15)	(0.05)	(0.41)
CEDAW date of ratification	1987	1992	1983	1990	1987	1990	1989
	(7.99)	(6.06)	(2.97)	(7.45)	(4.03)	(8.30)	(5.89)
Attitudes (%)	0.53	0.60	0.25	0.74	0.35	0.67	0.34
	(0.04)	(0.10)	(0.03)	(0.12)	(0.27)	(0.07)	(0.16)

Notes: Standard deviations are in parenthesis. The regions are: East Asia and the Pacific (EAP), Eastern Europe and Central Asia (EECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), Organisation for Economic Co-operation and Development (OECD), South Asia (SA) and Sub-Saharan Africa (SSA).

Finally, Table 2 presents the two SIGI instruments used in the econometric strategy: the year of ratification of the Convention on the Elimination of Discrimination Against Women (CEDAW) and negative attitudes towards women as political leaders. As of today, 189 countries have signed and ratified the CEDAW. Countries in LAC tend to have ratified the convention earlier than countries in other regions. Discriminatory attitudes also vary across regions: one person in four declares that men make better political leader than women do in LAC (25%), one third in SSA (34%) and OECD countries (35%), and about one in two in EAP (53%) and ECA (54%). Gender-biased attitudes towards political leadership are widespread in SA and MENA where 67% and 74% of the population respectively underestimated women's political leadership.

© OECD 2016

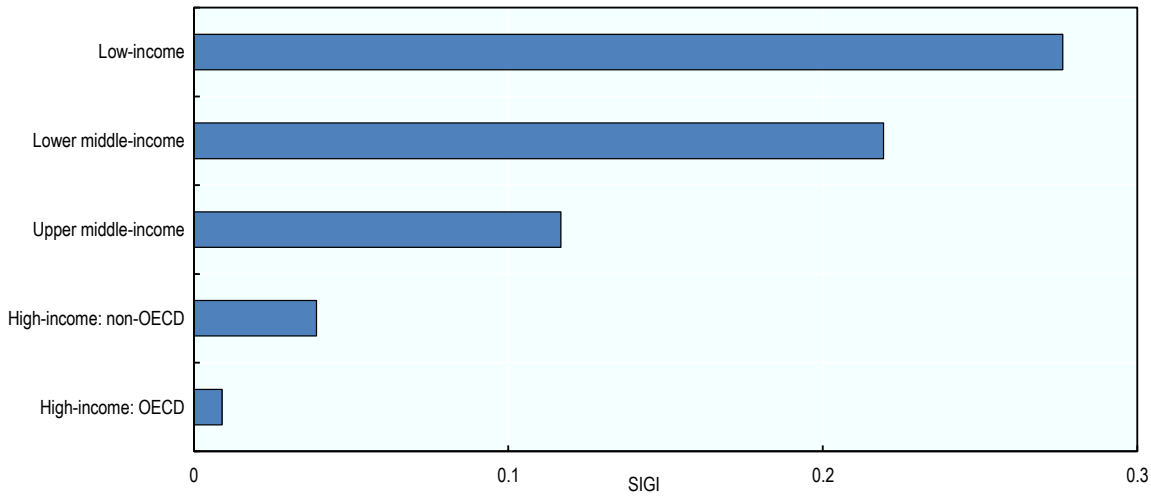
IV. EMPIRICAL RESULTS

We now turn to the central question of this paper: does gender discrimination in social institutions matter for economic development? To address this question, we start by investigating the relationship between the gender-based discrimination in social institutions, captured by the SIGI, and income per capita, measured by GDP per capita. Then, we study the non-linearity of this relationship. Finally, we look at channel decomposition to identify the channels through which gender-based discrimination in social institutions and other determinants of income operate.

Gender-based discrimination in social institutions and income

It is useful to look at the simple bivariate relationships between discriminatory social institutions and income before discussing the results of the multivariate analysis. Levels of income per capita are highly correlated with the level of gender discrimination in social institutions (correlation coefficient of -0.73, significant at 1% level). Figure 1 presents SIGI scores per income groups. A clear and unambiguously negative relationship emerges: high income countries have lower levels of gender-based discrimination in social institutions compared to middle- and low-income countries.

Figure 1. **SIGI by income groups**



Notes: The SIGI ranges from 0, indicating lowest discrimination, to 1, indicating maximum discrimination. For a definition of income groups see endnote 5.

Source: OECD (2014a), *Gender, Institutions and Development Database*, http://stats.oecd.org and World Bank (2014b), *World Development Indicators*, http://data.worldbank.org/data-catalog/world-development-indicators (accessed 7 July 2015).

We now present the empirical results of the multivariate analysis. To analyse the relationship between gender-based discrimination in social institutions and income, we use different estimators (OLS and 2SLS) and specifications as described in the empirical strategy. Table 3 summarises the main results from the reduced-form equation (equation 6) while Annex A presents the full regression results. All the regressions have a high explanatory power and perform well on specification tests. OLS estimations suggest a strong, negative and significant relationship between the SIGI and income per capita in all specifications. Including additional controls does not affect the results: higher levels of gender-based discrimination in social institutions are associated with lower levels of income per capita.

Table 3. **SIGI and income per capita**

	OLS				IV		
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**
	Dependent variable: Income per capita						
SIGI	-0.388***	-0.103**	-0.126**		-0.282**	-0.085**	-0.082**
	(0.059)	(0.045)	(0.057)		(0.129)	(0.035)	(0.034)
GII		-0.360		-0.510**		-0.057	
		(0.302)		(0.209)		(0.042)	
Gender gap in LFP			-0.978**				-0.954***
			(0.385)				(0.099)
Gender gap in education			-1.721***				-0.563*
			(0.517)				(0.312)
Adjusted R2	0.62	0.82	0.87	0.71	0.66	0.86	0.81
N	101	91	82	81	57	47	47
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	No	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the SIGI and measures of gender inequality in outcomes are presented. Column (1) only includes the SIGI and regional dummies. Columns (2)-(4) include the complete sets of control variables (including income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables). While columns (2) and (4) use GII as a proxy for gender inequality in outcomes, column (3) uses gender gaps in education and labour force participation.

The 2SLS results[16] demonstrate that the negative relationship between gender-based discrimination in social institutions and income per capita remain significant when controlling

16. To address instrument validity, Annex A presents the first stages of the 2SLS estimations. First, the exogeneity of income per capita is rejected by the Wu-Hausman test at the 5% level. Second, the two instruments have significant explanatory power on the level of gender-based discrimination in social institutions, while they are not correlated with income per capita. Indeed, the correlation coefficient between the CEDAW date of ratification and the SIGI and income per capita are respectively equal to 0.58 (significant at 10% level) and 0.11 (not significant); and the correlation coefficient between the percentage of respondents declaring that men make better political leaders than women and the SIGI and income per capita are respectively equal to 0.62 (significant at 10% level) and 0.19 (not significant).

© OECD 2016

for potential endogeneity, although it reduces the size of the SIGI coefficient. Moreover, this negative link is confirmed when controlling for the level of development as captured by initial levels of income, geography (latitude and landlocked), institution (civil liberties and rule of law), macroeconomic policies (international trade and inflation), natural resources (oil and other natural resources), culture (ethnic and religious fractionalisation), region-specific characteristics, and gender inequality in outcomes.

Finally, the effect remains significantly negative when submitted to the following robustness checks: i) controlling for convergence issues and initial levels of development by introducing lagged GDP values; ii) excluding high-income countries such as OECD countries; and iii) using alternative measures of GDP (Annex B). All in all, this indicates that the estimated effect of gender-based discrimination in social institutions on income per capita is negative, fairly stable and robust, although this effect shows an association but cannot prove causality.

Control variables have the expected sign: being landlocked, having high fertility rates and high gender gaps in education and labour force or in broader outcomes are associated with lower levels of income. By contrast, having good institutions, ensuring civil liberties, being well integrated in international trade, being an oil net-export country and having higher levels of physical and human capital as well as higher labour force and productivity are associated with higher levels of income. Finally, the convergence assumption is confirmed.

What is also remarkable is that gender-based discrimination reduces countries' income levels beyond the negative effect of gender inequality in outcomes. While previous empirical papers highlighted the negative relationship between growth and gender inequality in education and labour force participation or broader measures of gender disparities in outcomes, such as the GII (Amin, Kuntchev and Schmidt, 2015), our empirical results emphasise the key role of discriminatory social institutions. The fact that the SIGI coefficient remains significant when controlling for other types of gender inequality that are highly correlated with the SIGI suggests that what we measure is the net effect of gender discrimination in social institutions filtered from the effect of gender inequality in outcomes. Finally, in the specifications where the GII

As a heuristic test, the instruments were included in the main regression (where the endogenous variable, the SIGI, was also included without being instrumented); they come out non-significant, suggesting that they affect income per capita only through their impact on the level of gender-based discrimination in social institutions. Moreover, we do not reject the null hypothesis that instruments' coefficients are equal to zero when we regress the residuals. In addition, a simple estimation of the SIGI, including additional controls and instruments, results in a relatively high partial *R*. Finally the Stock-Yogo (F-stat) and the Sargan (Hansen J-stat) tests do not reject the set of instruments used at the 5% level; The Stock-Yogo critical values for the weak instrument test based on 2SLS size are used (Stock and Yogo, 2005). The test rejects the null hypothesis of weak instrument if the Cffoo-Donald F statistic exceeds the critical value and concludes that the instruments are strong. The critical values for one included endogenous regress and two instrumental variables are 19.93 for a desired maximal size of 10%, 11.59 for a desired maximal size of 15%, 8.75 for a desired maximal size of 20% and 7.25 for a desired maximal size of 25% (significance level is 5%).

coefficients were negative and significant, introducing the SIGI makes the GII coefficients no more significant, while the SIGI ones remain (Table 3). This confirms the strong explanatory power of discriminatory social institutions on cross-country disparities in income.[17]

The heterogeneity in the growth-gender discrimination relationship

This section further points to the heterogeneity in the growth-SIGI relationship. Following Amin, Kuntchev and Schmidt (2015), this paper assumes that the strength of the relationship between gender-based discrimination in social institutions and income may vary with the level of economic development. This paper presumes that in low-income countries, gender-based discrimination in social institutions represents an additional growth bottleneck. Such discrimination reinforces other growth bottlenecks, such as poor infrastructure, education and other characteristics. Hence, the effect of gender-based discrimination on income would be more detrimental for low-income countries.

Empirical results using both quintile regression and OLS regressions with interaction terms demonstrate the non-linearity of the effect (Annexes C and D, respectively). Table 4 summarises the estimated effect of gender-based discrimination in social institutions on income by income groups using quintile regressions of equation 5 as well as OLS regressions of equation 6. In the OLS regressions, whatever the set of controls used, the estimated coefficient of the interaction term is always negative for low-income countries and positive for high-income countries, and statistically significant. By contrast, the interaction term with middle-income countries is not significant, meaning that for this income group, the negative impact of discriminatory social institutions on income is not statistically different than the average impact. However, the size of the coefficients indicates that the negative effect of gender-based discrimination in social institutions is more detrimental for low-income countries than for high-income countries. Similarly, in the quintile regressions, irrespective of the set of controls included, the SIGI coefficients are significant in all specifications and decreases with income: the richer the country, the lower the negative impact of discriminatory social institutions on income. Reducing gender discrimination in social institutions appears therefore even more critical for the poorest countries of the world.

17. Preliminary analysis shows that the negative effect of discriminatory social institutions on income is mainly driven by social institutions that discriminate against women and girls within the family and restrict their physical integrity. However, those results are not presented in this paper and would be the object of further research.

© OECD 2016

Table 4. **Heterogeneity in the income-SIGI relationship**

	Dependent variable: Income per capita		
	Quintile regression		
	(1)	(2)	(3)
SIGI (High-income countries)	-0.357***	-0.074**	-0.164**
	(0.090)	(0.031)	(0.074)
SIGI (Middle-income countries)	-0.394***	-0.093**	-0.177**
	(0.117)	(0.043)	(0.072)
SIGI (Low-income countries)	-0.424***	-0.131**	-0.212**
	(0.091)	(0.054)	(0.082)
N	101	91	82
	OLS regression with interaction terms		
	(1)	(2)	(3)
SIGI	-0.307***	-0.033**	-0.109**
	(0.055)	(0.014)	(0.045)
SIGI*High-income countries	0.164***	0.044**	0.064**
	(0.052)	(0.017)	(0.026)
SIGI*Middle-income countries	0.018	0.015	(0.027)
	(0.055)	(0.095)	(0.066)
SIGI*Low-income countries	-0.256***	-0.155**	-0.134**
	(0.065)	(0.064)	(0.055)
Adjusted R2	0.71	0.84	0.88
N	101	91	82
Region dummies	Yes	Yes	Yes
Controls	No	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the SIGI is presented. Column (1) only includes the SIGI and regional dummies. Columns (2) and (3) include the complete sets of control variables (including income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables). While column (2) uses GII as a proxy for gender inequality in outcomes, column (3) uses gender gaps in education and labour force participation. The quintile regressions estimated the SIGI coefficient for the median, the top and bottom income quartiles separately.

Decomposing the channels of economic growth through which discriminatory social institutions operate

Estimations of equation 6 demonstrate that discriminatory social institutions are an important factor influencing income. While the reduced-form equation provides estimations of the total effect of the level of gender-based discrimination in social institutions on income per capita, with and without controls for gender inequality in outcomes, it is quite interesting to further look at the channels of transmission.

Table 5. **Decomposition of the Growth-SIGI relationship: TFP, human, physical capital and labour**

	OLS			IV		
	(1)	(2)	(3)	(1)	(2)	(3)
	Dependent variable = TFP					
SIGI	-0.094***	-0.084**	-0.078**	-0.038***	-0.076**	-0.067**
	(0.029)	(0.035)	(0.034)	(0.307)	(0.031)	(0.026)
Adjusted R2	0.37	0.73	0.73	0.33	0.68	0.69
N	65	64	64	40	40	40
	Dependent variable = Human capital					
SIGI	-0.095***	-0.093**	-0.083**	-0.024**	-0.081**	-0.078**
	(0.036)	(0.039)	(0.039)	(0.010)	(0.033)	(0.032)
Adjusted R2	0.63	0.78	0.82	0.61	0.57	0.58
N	85	82	82	48	47	47
	Dependent variable = Physical capital					
SIGI	-0.474***	-0.018	-0.139	-0.700**	-1.269	-1.426
	(0.067)	(0.123)	(0.095)	(0.302)	(1.434)	(2.216)
Adjusted R2	0.68	0.83	0.88	0.73	0.78	0.79
N	101	91	82	57	51	47
	Dependent variable = Labour					
SIGI	-0.304**	-0.193**	-0.166**	-0.180**	-0.149**	-0.121**
	(0.126)	(0.087)	(0.083)	(0.085)	(0.071)	(0.057)
Adjusted R2	0.34	0.67	0.67	0.41	0.71	0.71
N	101	91	82	57	51	47
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity only the SIGI is presented. Column (1) only includes the SIGI and regional dummies. Columns (2) and (3) include the complete sets of control variables (including income groups in 2000, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, inflation, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, gender gap in outcomes and regional dummy variables; government expenditure in education and the share of female teacher are also included when explaining human capital stock; the total level of education is also included when explaining labour force participation rates). While column (2) uses GII as a proxy for gender inequality in outcomes, column (3) uses gender gaps in education and/or labour force participation. Gender inequality in education is excluded when explaining human capital stock; similarly gender inequality in labour force participation is excluded when explaining labour.

Under channel decomposition, discriminatory social institutions could affect income through their effect on physical capital accumulation, human capital acquisition, the size of the labour force and/or total factor productivity. Estimations of equations 2-5 confirm the indirect links between the level of gender-based discrimination in social institutions and income. Table 5 shows a strong negative and significant relationship between the SIGI and both total factor productivity, labour force and human capital, whatever the specification used (Annexes E, F and G present the full regression results). The SIGI coefficients remain significantly negative while introducing additional control variables, controlling for potential endogeneity and performing robustness checks. Higher levels of gender-based discrimination in social institutions appear to

© OECD 2016

lower the levels of factor productivity, labour force and human capital. Additional analyses undertaken separately for men and women (equations 7-8) further demonstrate that discriminatory social institutions negatively affect growth determinants by reducing both the level of female education and labour force participation, without affecting male outcomes.[18]

All in all, the results suggest that the negative effect of gender-based discrimination in social institutions on income tend to operate through its negative influence on the level of female human capital and female labour force, as well as through a negative influence on technological progress and the efficiency with which human capital and labour inputs are used in production. By contrast, the relationship between the SIGI and physical capital is mixed: while naive regression with capital stock as the dependant variable yields a negative and statistically significant association, the association vanishes when including additional controls.

18. For sake of brevity, the regression results of equation (7) and (8) are not presented. They are available upon request.

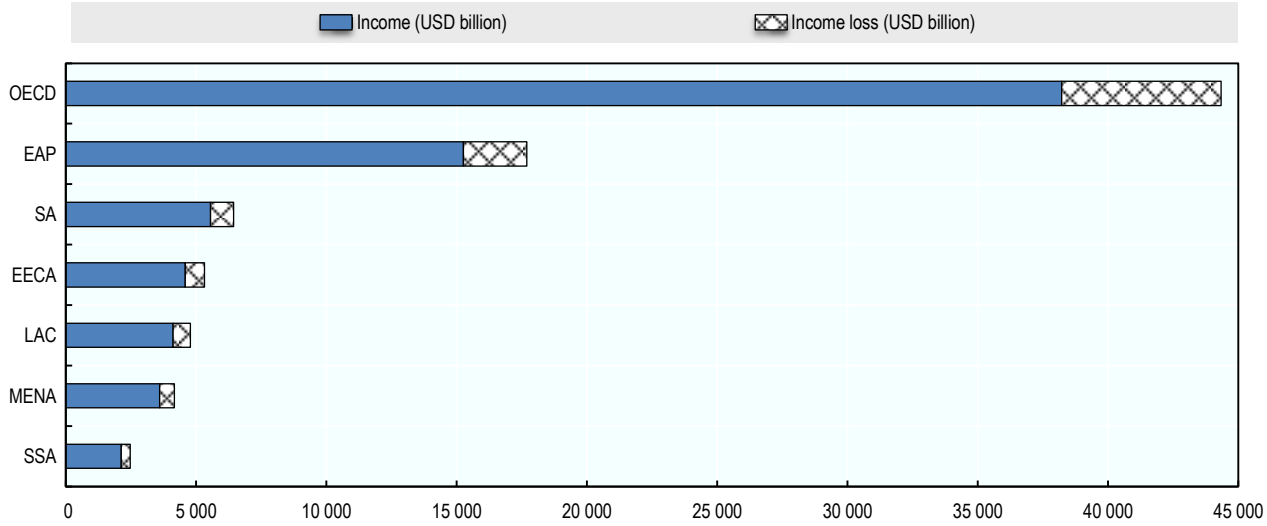
V. QUANTIFYING THE EFFECTS OF GENDER-BASED DISCRIMINATION IN SOCIAL INSTITUTIONS

The previous section demonstrated that the negative association between gender discrimination and income is not restricted to gender gaps in education and labour outcomes but also can be linked to discriminatory social institutions. In this section, the 2SLS coefficients of the previous growth equation (equation 6) are used first to quantify the economic cost of gender-based discrimination in social institutions and second to estimate the economic gains associated with greater gender parity.

The cost of gender-based discrimination in social institutions

The deprivation resulting from discriminatory social institutions is affecting not only women's well-being, but also society's well-being as a whole through a reduction in potential income. Using as a benchmark a world with no gender discrimination in social institutions, the current level of discrimination is estimated to induce a loss of up to USD 12 trillion or 16% of global income.

Figure 2. **Income and income loss associated with discriminatory social institutions by region**



Notes: This figure presents the regional income and income loss associated with current levels of gender-based discrimination in social institutions. Income losses are measured in terms of 2011 real income at current PPP. The regions are: East Asia and the Pacific (EAP), South Asia (SA), Latin America and the Caribbean (LAC), Sub-Saharan Africa (SSA), Eastern Europe and Central Asia (EECA) and Middle East and North Africa (MENA). This regional classification excludes Organisation for Economic Co-operation and Development (OECD) countries, which are represented as a stand-alone group.

Source: Authors' calculations.

© OECD 2016

Regional income losses attributable to current levels of gender-based discriminatory social institutions are presented in Figure 2. In absolute terms,[19] the costs of gender-based discrimination in social institutions are the highest in OECD and East Asia and the Pacific (EAP) countries where they represent respectively about USD 6 116 billion and USD 2 440 billion. They are also substantial in other regions of the world: USD 888 billion in South Asia (SA), USD 733 billion in Eastern Europe and Central Asia (EECA), USD 658 billion in Latin America and the Caribbean (LAC), USD 575 billion in Middle East and North Africa (MENA), and USD 340 billion in sub-Saharan Africa (SSA).

Estimating the gains resulting from greater gender parity in social institutions

The discussion above has shown that the costs of gender-based discrimination in social institutions could be huge when compared with an ideal counterfactual characterised by a world with no discrimination. We are now interested to simulate the potential macroeconomic gains associated with a gradual reduction in the level of discriminatory social institutions under different scenarios.

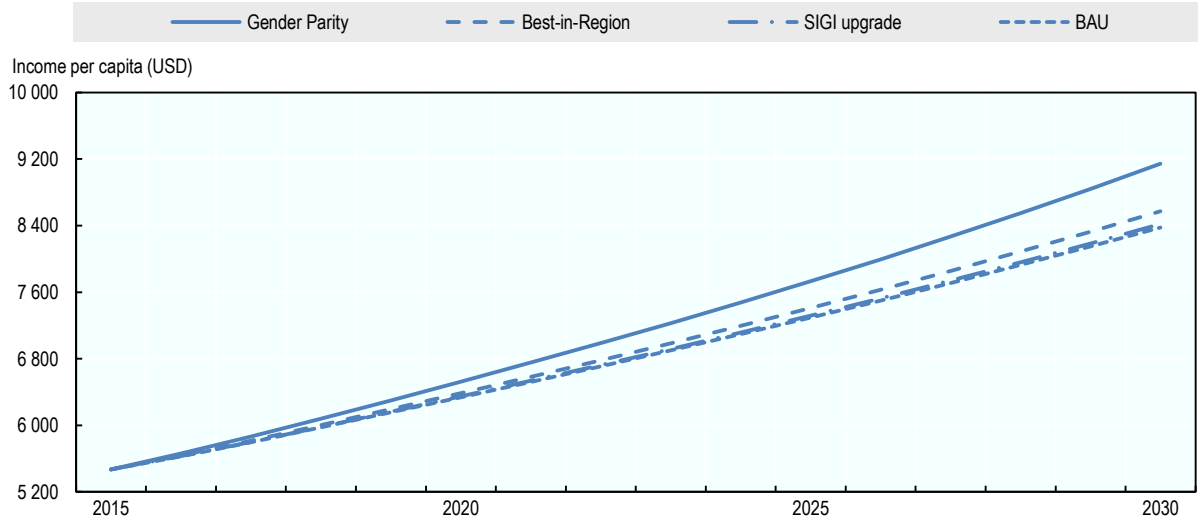
First, we investigate how reaching the ambitious targets of gender equality under Sustainable Development Goal 5 would translate in terms of income per capita in the next 15 years. Specifically, we forecast the world income in 2030 if discriminatory social institutions would be eradicated or at least reduced under four possible scenarios: i) business-as-usual (BAU), using the available growth forecast[20] and assuming no change in the level of gender-based discrimination in social institutions between 2015 and 2030; ii) upgrade in the SIGI classification, considering that each country would decrease its level of gender-based discrimination in social institutions to attain a lower group along the SIGI classification in 2030; iii) best-in-region, using the best performer of the region as a benchmark and assuming total homogeneity within the region in 2030;[21] and iv) gender parity, assuming that countries would have eradicated gender-based discrimination in social institutions by 2030, as illustrated by a SIGI score equal to zero.

19. In absolute terms, the loss is higher for countries and regions having higher levels of income, as measured by the GDP.

20. Real GDP per capita (in 2005 USD) baseline projections are from the International Macroeconomic Data Set compiled by the Economic Research Service of the United States Department of Agriculture, available at www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx.

21. The regional best performers are Argentina, Belgium, Bhutan, Mongolia, Morocco, Serbia and South Africa.

Figure 3. **Global income per capita in 2030**



Note: GDP forecasts are measured in terms of 2011 real GDP per capita at current PPPs.

Source: Authors' calculations.

The projections under these different scenarios point to large potential income gains associated with decreased levels of gender-based discrimination in social institutions by 2030 (Figure 3 and Figures in Annex I). Using available growth forecasts, we estimate that compared to the business-as-usual scenario (scenario i), the average income per capita annual growth rates for the 108 countries included in the SIGI ranking would increase by 0.03 percentage point in the upgrade in the SIGI classification scenario (scenario ii), by 0.2 percentage point in the best-in-region scenario (scenario iii) and by 0.6 percentage point in the gender parity scenario (scenario iv).

Second, we consider the case of single countries. Annex I presents country examples using regional lowest performers in the SIGI, which are Albania, Bangladesh, Nicaragua, Sudan, Turkey and Yemen. The simulation findings show sizeable income gains for each scenario. For example, compared to the business-as-usual scenario, Turkey would see its annual income per capita growth rate increased by 0.1 percentage point by reducing its level of discrimination in social institutions to very low (scenario ii), by 0.4 percentage point by reaching the Belgian level of discrimination (scenario iii) and by 0.6 percentage point by eradicating discriminatory social institutions (scenario iv) over the next 15 years.

© OECD 2016

VI. CONCLUSION

Even if growth theory has blossomed, empirical works remain unable to fully explain the huge income differences between countries. Explanations based on greater technological progress, more investment and better education, as well as greater gender equality in outcomes leave unanswered the question of where these differences come from.

In this paper, we provide the evidence that gender-based discrimination in social institutions, measured by the OECD Development Centre's SIGI, matters for countries' levels of income. Specifically, our analysis aimed at: i) uncovering a possible link between the SIGI and income per capita, ii) assessing the potential non-linearity of this link, iii) further identifying the channels through which gender-based discrimination in social institutions may influence countries' levels of income, and iv) providing some estimates of the economic costs of gender-based discriminatory institutions as well as measures of economic gains related with different gender inequality reducing scenarios.

The results show, first of all, that gender-based discrimination in social institutions impedes economic development beyond its effect on gender inequality in outcomes, by reducing countries' levels of income. This effect is stronger for low-income countries and seems to operate by lowering total factor productivity and by reducing the level of education and labour participation among women.

Moreover, the simulations show that the income loss associated with current levels of discrimination could be substantial, estimated at up to USD 12 trillion, 16% of current world income. At the same time, they show that a gradual dismantling of gender-based discrimination in social institutions could yield substantial economic benefits, leading to an annual increase in the income global growth rate of 0.03 to 0.6 percentage points by 2030, depending on the scenario.

All in all, these results underscore the extent to which gender discrimination in social institutions needs to be integrated in growth analysis. From a policy perspective, they bear several implications. First, while the case is strong for supporting gender parity in outcomes, other interventions that directly tackle gender discrimination in social institutions are critical for economic development. While discussing specific policy options goes beyond the scope of this paper, the SIGI 2014 report (OECD, 2014b) provides examples of how social institutions can be transformed through gender-responsive and gender-transformative policies and interventions. Second, as discriminatory social institutions seem to represent an additional growth bottleneck for low-income countries, unlocking this growth potential could be particularly beneficial for the world's least developed countries. Looking forward, further research could be undertaken to identify which types of discriminatory social institutions may have the most detrimental effects and which specific interventions should thus be pursued.

© OECD 2016

REFERENCES

ACEMOGLU, D., J. ROBINSON and S. JOHNSON (2002), "Reversal of fortune: Geography and institutions in the making of the modern world income distribution", *The Quarterly Journal of Economics*, *117*(4), 1231–1294.

ACEMOGLU, D. and S. JOHNSON (2005), Unbuilding Institutions, journal, pf Political Economy, 113(5), 949-995.

AICHELE, R. and G. FELBERMAYR (2013), The Effect of the Kyoto Protocol on Carbon Emissions, *Journal of Policy Analysis and Management, Vol. 32, No. 4, 731–757.*

ALESINA, A. et al. (2003), "Fractionalization", *Journal of Economic Growth*, 8, 155-194.

AMIN, M., V. KUNTCHEV and M. SCHMIDT (2015), "Gender inequality and growth. The case of rich vs. poor countries", *World Bank Policy Research Working Paper*.

BARRO, R. J. and J.W. LEE (2010), "A new data set of educational attainment in the world, 1950-2010" *Journal of Development Economics, 104*, 184–198.

BRANISA B. et al. (2014), "Measuring gender inequality in social institutions: The Social Institutions and Gender Index", *Feminist Economics, 20 (2), pp. 29–64.*

BRANISA, B., S. KLASEN and M. ZIEGLER (2013), "Gender inequality in social institutions and gendered development outcomes", *World Development*, *45*, 252–268.

CEPII (2014), *GEODIST* (database), Centre d'études prospectives et d'informations internationales, www.cepii.fr (accessed 7 July 2015).

CICCONE, A. and M. JAROCIŃSKI (2010), "Determinants of economic growth: Will data tell?", *American Economic Journal: Macroeconomics*, *2*, 222–246.

CUBERES, D. and M. TEIGNER (2015), "How costly are labor gender gaps ? Estimates for the Balkans and Turkey", *World Bank Policy Research Working Paper*.

CUBERES, D. and M. TEIGNER (2013), "Aggregate costs of gender gaps in the labor market: A quantitative estimate", *Conference on Structural Change, Dynamics and Economic Growth,* 1–26.

CINGRANELLI, D. L. and D. L. RICHARDS (2010), "The Cingranelli and Richards (CIRI) human rights data project", *Human Rights Quarterly*, *32*(2), 401–424.

DFID (2008), Growth: Building Jobs and Prosperity in Developing Countries, Department for International Development.

DIAMOND, J. and G. GUNS (1997), "Steel: The fates of human societies", *W. W. Norton*, New York.

DOLLAR, D. and R. GATTI (1999), "Gender inequality income and growth: Are good times good for women?", The World Bank, Washington, DC.

FEENSTRA, R. C., R. INKLAAR and M. TIMMER (2015), "The next generation of the Penn World Table", *American Economic Review*, 105(10), 3150-82, www.ggdc.net/pwt (accessed 7 July 2015).

FERRANT, G. (2015), "How gender inequalities hinder development : Cross-country evidence", *Annalesd'EconomieetStatistiques*, (117/118), 106–112.

© OECD 2016

FERRANT, G. and K. NOWACKA (2015), "Measuring the drivers of gender inequality and their impact on development: The role of discriminatory social institutions" *Gender & Development*, *23*(2), 319–332.

FERRANT, G. and M. TUCCIO (2015), "South-south migration and discrimination against women in social institutions: A two-way relationship", *World Development*, *72*(C), 240–254.

FRANKEL, J. and D. ROMER (1999), "Does trade cause growth?", *American Economic Review*, *89*(1991).

FREEDOM HOUSE (2014), *Political rights and civil liberties database* , https://freedomhouse.org/report-types/freedom-world.

GONZALES, C., S. JAIN-CHANDRA, K. KOLCHHAR and M. NEWIAK (2015) Fair play: More equal laws boost female labour force participation, *IMF Staff Discussion Note*, Washington: International Monetary Fund.

HARPER, C. et al (2014), "Measuring women's empowerment and social transformation in the post-2015 agenda", *ODI and OECD*.

KABEER, N and L. NATALI (2013) Gender equality and economic growth. Is there a win-win? Institute of Development Studies working paper 417.

KLASEN, S. (2002), "Low schooling for girls, slower growth for all? Cross-country evidence on the effect of gender inequality in education on economic development", *World Bank Economic Review*, *16*(3), 345–373.

KLASEN, S. and F. LAMANNA (2009), 'The Impact of Gender Inequality in Education and Employment on Economic Growth: New Evidence for a Panel of Countries', *Feminist Economics 15.3: 91-132*.

KNOWLES, S., P. LORGELLY and D. OWEN (2002), "Are Educational Gender Gaps a Brake on Economic Development? Some Cross-Country Empirical Evidence", *Oxford Economic Papers*, 54(1), 118-149.

KRUEGER, A. B. and M. LINDAHL (2001), Education for Growth: Why and For Whom? *Journal of Economic Literature Vol. 39 pp. 1101–1136*

LAGERLÖF, N.-P. (2003), "Gender Equality and Long-Run Growth", *Journal of Economic Growth*, *8*, 403–426.

LORGELLY, P. K. (2000), "Are there gender-separate human capital effects on growth? A review of the recent empirical literature" *U. of Nottingham CREDIT Working Paper No. 00/13*.

LUCI, A., J. JÜTTING and C. MORRISSON (2012), "Why do so many women end up in "bad jobs"? A cross-country assessment for developing countries", *European Journal of Development Research*, *24*, 530–549.

MANKIW, N. G., D. ROMER and D. N. WEIL (1992), "A contribution to the empirics of economic-growth" *Quarterly Journal of Economics*, *107*(2), 407–437.

MORRISSON, C. and J. JUTTING (2005), "Women's Discrimination in Developing Countries: A New Data Set for Better Policies," *World Development*, 33(7), 1065-1081.

OECD (2014a), "Gender, Institutions and Development Database", OECD Development Centre https://stats.oecd.org/Index.aspx?DataSetCode=GIDDB2014 (accessed 7 July 2015).

OECD (2014b), "Social Institutions and Gender Index (SIGI) 2014 Synthesis report", OECD Development Centre.

OECD (2012), "Closing the gender gap: Act now", OECD Publishing, Paris.

PSACHAROPOULOS, G. (1994), "Returns to investment in education: A global update", *World Development*, *22*(9), 1325–1343.

RODRIK, D., A. SUBRAMANIAN and F. TREBBI (2004), "Institutions rule: The primacy of institutions over geography and integration in economic development", *Journal of Economic Growth*, *9*(2), 131–165.

SACHS, J. D. and A. M. WARNER (2001), "The curse of natural resources", *European Economic Review*, *45*(4), 827–838.

SOLOW, R. M. (1956), "A contribution to the theory of economic growth", *The Quarterly Journal of Economics*, *70*(1), 65–94.

STOCK, J. H. and M. YOGO (2005), Testing for weak instruments in linear IV regression. In Identification and *Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, ed. D. W. K. Andrews and J. H. Stock, 80–108. Cambridge: Cambridge University Press.

TAYLOR, A. (1998), On the costs of inward-looking development. Journal of Economic History 58: 1-28.

THÉVENON, O. and A. SALVI DEL PERO (2015), "Gender equality (f)or economic growth? Effects of reducing the gender gap in education on economic growth in OECD countries" *Annals of Economics and Statistics*, (117-118), pp. 353–377.

UN (2016), *The Convention on the Elimination of All Forms of Discrimination against Women* (CEDAW), https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-8-b&chapter=4&lang=en (accessed 7 July 2015).

UNDP (2015), *Human Development Report database*, United Nations Development Programme, http://hdr.undp.org/en/composite/GII (accessed 7 July 2015).

WEIL, D. N. (2005), "Accounting for the effect of health on economic growth", *National Bureau of Economic Research Working Papers No. w11455*.

WOETZEL, J. et al. (2015), "The power of parity: How advancing women's equality can add $12 trillion to global growth", McKinsey Global Institute.

WORLD BANK (2015), "Women, Business and the Law 2016: Getting to equal", The World Bank, Washington, DC.

WORLD BANK (2014a), *World Governance Indicators* (database), World Bank, Washington, DC, http://data.worldbank.org/data-catalog/worldwide-governance-indicators (accessed 7 July 2015).

WORLD BANK (2014b), *World Development Indicators* (database), World Bank, Washington, DC. http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators (accessed 7 July 2015).

WORLD VALUE SURVEY (2014), *World Value Survey*, www.worldvaluessurvey.org/wvs.jsp (accessed 7 July 2015).

© OECD 2016

Annex A. The total effect of SIGI on income per capita (OLS and IV estimations)

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Second-stage: Dependent variable = Income per capita						
SIGI	-0.388***	-0.103**	-0.126**	-0.282**	-0.085**	-0.082**
	(0.059)	(0.045)	(0.057)	(0.129)	(0.035)	(0.034)
Latitude		0.009**	0.018**		0.010**	0.011**
		(0.004)	(0.008)		(0.005)	(0.005)
Landlocked		-0.239**	-0.365**		-0.124**	-0.179**
		(0.109)	(0.166)		(0.056)	(0.081)
Rule of law		0.664***	0.598***		0.625***	0.952***
		(0.205)	(0.193)		(0.227)	(0.160)
Ethnic fractionalisation		-0.497**	-0.215**		-0.113**	-0.191***
		(0.226)	(0.098)		(0.051)	(0.087)
Religion		-0.218**	-0.134**		-0.127**	-0.013**
		(0.099)	(0.061)		(0.058)	(0.006)
GII		-0.360			-0.057	
		(0.302)			(0.042)	
Gender gap in LFP			-0.978**			-0.954***
			(0.385)			(0.099)
Gender gap in education			-1.721***			-0.563*
			(0.517)			(0.312)
Constant	7.544***	8.426***	8.760***	6.614***	2.034***	3.840***
	(0.221)	(0.411)	(0.522)	(0.541)	(0.700)	(0.639)
R2	0.62	0.82	0.87	0.66	0.86	0.81
N	101	91	82	57	47	47
Panel B. First-stage: Dependent variable = SIGI						
CEDAW				0.218**	0.116**	0.116**
				(0.091)	(0.050)	(0.050)
Attitudes				1.520**	1.083**	1.083**
				(0.635)	(0.534)	(0.534)
Latitude					-0.011*	-0.011*
					(0.005)	(0.005)
Landlocked					0.052*	0.052*
					(0.027)	(0.027)
Rule of law					-0.565**	-0.565**
					(0.250)	(0.250)
Ethnic fractionalization					0.533	0.533
					(0.341)	(0.341)
Religion					0.393**	0.393**
					(0.167)	(0.167)
Constant				1.849***	1.355***	1.355***
				(0.177)	(0.175)	(0.175)
Adjusted R2				0.28	0.89	0.89
N				57	47	47
F-stat				9.42	8.88	8.88
Hansen J-stat				1.38	3.26	3.26
Additional controls	No	Yes	Yes	No	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables. The Stock-Yogo critical values for the weak instrument test based on 2SLS size are used (Stock and Yogo, 2005). The critical value for one included endogenous regress and two instrumental variables are 8.75 for a desired maximal size of 20% (significance level is 5%).

Annex B. **Robustness checks**

	GDP per capita from WDI			Without OECD countries			With convergence		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable = Income per capita								
SIGI	-0.621***	-0.132**	-0.101**	-0.421***	-0.196**	-0.271**	-0.155***	-0.102**	-0.101**
	(0.081)	(0.055)	(0.046)	(0.106)	(0.097)	(0.131)	(0.053)	(0.047)	(0.045)
Convergence							-1.029***	-0.938***	-0.877***
							(0.065)	(0.154)	(0.179)
Latitude		0.007**	0.006**		0.003**	0.002**		0.002**	0.002**
		(0.003)	(0.003)		(0.001)	(0.001)		(0.001)	(0.001)
Landlocked		-0.372***	-0.477***		-0.340***	-0.360***		-0.288**	-0.313**
		(0.130)	(0.135)		(0.127)	(0.127)		(0.112)	(0.125)
Rule of law		0.852***	0.739***		0.241	0.565***		0.219*	0.231**
		(0.179)	(0.162)		(0.154)	(0.194)		(0.112)	(0.108)
Ethnic fractionalisation		-0.295**	-0.092**		-0.381**	-0.511*		-0.207**	-0.178**
		(0.134)	(0.042)		(0.155)	(0.286)		(0.094)	(0.079)
Religion		-0.111**	-0.248**		-0.306**	-0.152**		-0.055**	-0.051**
		(0.050)	(0.113)		(0.139)	(0.069)		(0.025)	(0.023)
GII		-0.491			0.009			-0.295	
		(0.370)			(0.011)			(0.494)	
Gender gap in LFP			-0.706**			-0.227**			-0.433**
			(0.320)			(0.103)			(0.197)
Gender gap in education			-0.359**			-0.184**			-0.334**
			(0.164)			(0.075)			(0.152)
Constant	5.778***	6.753***	7.165***	7.550***	2.261	5.898***	-1.388***	-1.110**	-1.138**
	(0.273)	(0.455)	(0.498)	(1.129)	(1.837)	(1.388)	(0.451)	(0.505)	(0.571)
Adjusted R2	0.65	0.87	0.92	0.89	0.94	0.90	0.92	0.95	0.95
N	104	94	85	75	74	75	99	81	81
Additional controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables.

© OECD 2016

Annex C. The non-linear total effect of SIGI on income per capita (quintile regressions)

	High income countries			Middle income countries			Low income countries		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable = Income per capita								
SIGI	-0.357***	-0.074**	-0.164**	-0.394***	-0.093**	-0.177**	-0.424***	-0.131**	-0.212**
	(0.090)	(0.031)	(0.074)	(0.117)	(0.043)	(0.072)	(0.091)	(0.054)	(0.082)
Latitude		0.010**	0.007**		0.006**	0.003**		0.002**	0.004**
		(0.005)	(0.003)		(0.003)	(0.001)		(0.001)	(0.002)
Landlocked		-0.340*	-0.250*		-0.396**	-0.405***		-0.099**	-0.497**
		(0.177)	(0.147)		(0.157)	(0.150)		(0.045)	(0.204)
Rule of law		0.592***	0.700***		0.719***	0.702***		0.634***	0.596**
		(0.221)	(0.183)		(0.196)	(0.187)		(0.208)	(0.255)
GII (log)		-0.278			-0.214			-0.066	
		(0.301)			(0.268)			(0.284)	
Gender gap in LFP			-0.886**			-0.152***			-0.775**
			(0.414)			(0.024)			(0.352)
Gender gap in education			-0.582***			-0.876***			-0.560**
			(0.120)			(0.292)			(0.254)
Constant	7.611***	8.184***	8.249***	7.553***	8.119***	7.987***	7.240***	8.405***	8.338***
	(0.343)	(0.792)	(0.598)	(0.339)	(0.706)	(0.612)	(0.443)	(0.749)	(0.834)
N	101	91	82	101	91	82	101	91	82
Additional controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables. The quintile regressions estimated the SIGI coefficient for the median, the top and bottom quartiles.

© OECD 2016

Annex D. The non-linear total effect of SIGI on income per capita (interaction term regressions)

	OLS		
	(1)	(2)	(3)
	Dependent variable = Income per capita		
SIGI	-0.307***	-0.033**	-0.109**
	(0.055)	(0.014)	(0.045)
SIGI*High income	0.164***	0.004**	0.064**
	(0.052)	(0.017)	(0.026)
SIGI*Middle income	0.018	0.015	(0.027)
	(0.055)	(0.095)	(0.066)
SIGI*Low income	-0.256***	-0.155**	-0.134**
	(0.065)	(0.064)	(0.055)
Latitude		0.005**	0.007**
		(0.002)	(0.003)
Landlocked		-0.152**	-0.325**
		(0.069)	(0.135)
Rule of law		0.530**	0.483**
		(0.211)	(0.207)
GII (log)		-0.400	
		(0.302)	
Gender gap in LFP			-0.681*
			(0.362)
Gender gap in education			-0.649***
			(0.216)
Constant	7.742***	8.658***	9.062***
	(0.207)	(0.428)	(0.533)
Adjusted R2	0.71	0.84	0.88
N	101	91	82
Additional controls	No	Yes	Yes
Regional dummies	Yes	Yes	Yes

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables.

© OECD 2016

Annex E. **The effect of SIGI on TFP (OLS and IV estimations)**

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable = TFP					
SIGI	-0.094***	-0.084**	-0.078**	-0.038***	-0.076**	-0.067**
	(0.029)	(0.035)	(0.034)	(0.307)	(0.031)	(0.026)
Latitude		0.003**	0.003**		0.011**	0.044**
		(0.001)	(0.001)		(0.005)	(0.020)
Landlocked		-0.078**	-0.069**		-0.080**	-0.086**
		(0.035)	(0.031)		(0.036)	(0.039)
Rule of law		0.107**	0.039**		0.105**	0.106**
		(0.049)	(0.018)		(0.048)	(0.048)
Ethnic fractionalisation		-0.112**	-0.020**		-0.098**	-0.021**
		(0.051)	(0.009)		(0.045)	(0.010)
Religion		0.089	0.142		-0.257	0.859
		(0.264)	(0.365)		(0.484)	(0.702)
Oil		0.003	0.002		-0.033	0.062
		(0.007)	(0.009)		(0.028)	(0.883)
Natural resources		0.007	0.007		0.042	0.082*
		(0.006)	(0.007)		(0.033)	(0.043)
Openness		0.101**	0.098**		0.099**	0.069**
		(0.046)	(0.045)		(0.043)	(0.031)
Inflation		-0.011**	-0.012**		-0.009**	-0.058**
		(0.005)	(0.005)		(0.004)	(0.026)
GII		0.074			-0.035	
		(0.100)			(0.433)	
Gender gap in LFP			-0.304*			-0.081*
			(0.160)			(0.043)
Gender gap in education			-0.220*			-0.169*
			(0.116)			(0.089)
Constant	0.206***	0.356***	0.182***		2.079***	-1.743***
	(0.072)	(0.136)	(0.036)		(1.577)	(0.421)
Adjusted R2	0.37	0.73	0.73	0.33	0.68	0.69
N	65	64	64	40	40	40

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables.

© OECD 2016

Annex F. **The effect of SIGI on human capital (OLS and IV estimations)**

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable = Human capital					
SIGI	**-0.095*** **	**0.093** **	**0.083** **	**-0.024** **	**-0.081** **	**-0.078** **
	(0.036)	**(0.039)**	**(0.039)**	**(0.010)**	**(0.033)**	**(0.032)**
Latitude		0.005**	0.003**		0.016**	0.008**
		(0.002)	(0.001)		(0.007)	(0.004)
Landlocked		-0.003**	-0.114**		-0.185**	-0.178**
		(0.001)	(0.052)		(0.084)	(0.081)
Rule of law		0.171**	0.069**		0.104**	0.106**
		(0.078)	(0.031)		(0.047)	(0.048)
Ethnic fractionalisation		-0.180**	-0.012**		-0.072**	-0.071**
		(0.082)	(0.005)		(0.033)	(0.032)
Religion		-0.534***	-0.509***		-0.831*	-0.562*
		(0.171)	(0.183)		(0.466)	(0.312)
Oil		0.003	-0.003		0.002	0.005
		(0.005)	(0.004)		(0.012)	(0.014)
Natural resources		0.001	0.005		-0.008	-0.002
		(0.004)	(0.004)		(0.012)	(0.016)
Openness		0.003***	0.002**		0.004**	0.014**
		(0.001)	(0.001)		(0.002)	(0.007)
Inflation		-0.004**	-0.004**		-0.012**	-0.012**
		(0.002)	(0.002)		(0.006)	(0.005)
GII		-0.242**			-0.724	
		(0.112)			(0.744)	
Gender gap in LFP			0.109			-0.537
			(0.222)			(0.829)
Constant	2.076***	2.038***	2.390***	2.520***	2.667***	2.659***
	(0.139)	(0.268)	(0.245)	(0.352)	(0.258)	(0.475)
Adjusted R2	0.63	0.78	0.82	0.61	0.57	0.58
N	85	82	82	48	47	47

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, government expenditure in education, the share of female teacher, gender gap in LFP and regional dummy variable.

© OECD 2016

Annex G. The effect of SIGI on physical capital (OLS and IV estimations)

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable = Physical capital					
SIGI	-0.474***	-0.018	-0.139	-0.700**	-1.269	-1.426
	(0.067)	(0.123)	(0.095)	(0.302)	(1.434)	(2.216)
Latitude		0.017**	0.018**		0.023**	0.014**
		(0.008)	(0.008)		(0.011)	(0.006)
Landlocked		-0.301**	-0.382**		-0.117**	-0.657**
		(0.150)	(0.171)		(0.058)	(0.273)
Rule of law		0.893***	0.873***		0.838**	0.769**
		(0.210)	(0.206)		(0.331)	(0.347)
Ethnic fractionalisation		-0.465**	-0.083**		-0.049**	-0.056**
		(0.211)	(0.038)		(0.022)	(0.025)
Religion		0.219	-0.120		0.950	0.324
		(0.434)	(0.427)		(0.722)	(0.697)
Oil		0.019*	0.020**		0.053**	0.039**
		(0.011)	(0.010)		(0.026)	(0.020)
Natural resources		0.002	0.007		-0.046	-0.014
		(0.010)	(0.008)		(0.029)	(0.032)
Openness		0.011**	0.012**		0.014**	0.013**
		(0.006)	(0.005)		(0.006)	(0.005)
Inflation		-0.005**	-0.010**		-0.011**	-0.016**
		(0.002)	(0.005)		(0.005)	(0.007)
GII		-0.460*			-0.796	
		(0.248)			(1.149)	
Gender gap in LFP			0.861*			-2.326
			(0.472)			(2.913)
Gender gap in education			-1.412**			-1.604
			(0.611)			(1.440)
Constant	8.544***	9.187***	9.809***	8.644***	5.185***	2.322***
	(0.269)	(0.556)	(0.649)	(0.637)	(1.023)	(0.101)
Adjusted R2	0.68	0.83	0.88	0.73	0.78	0.79
N	101	91	82	57	51	47

Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, gender gap in outcomes and regional dummy variables

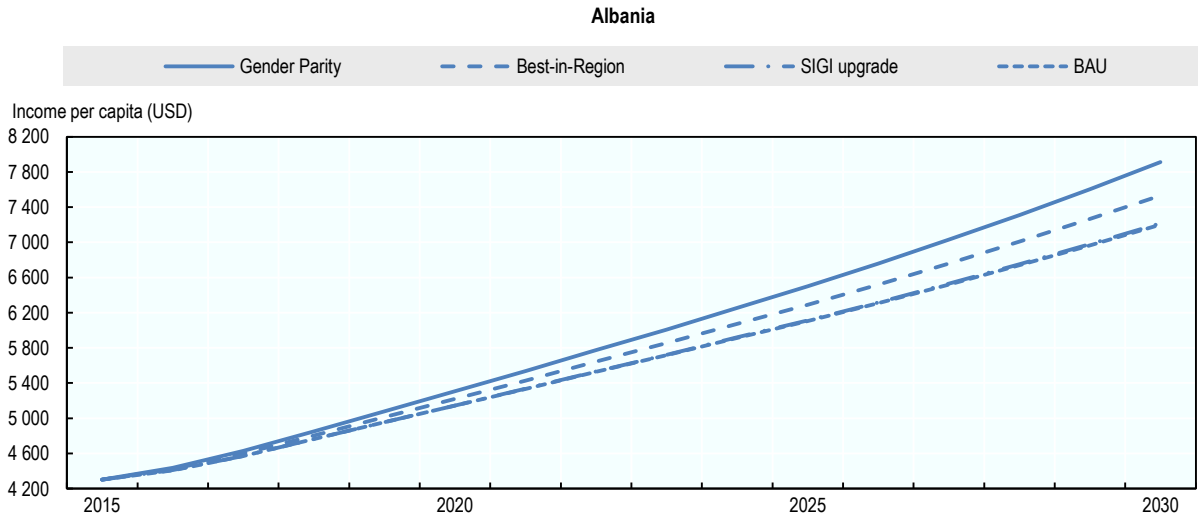
Annex H. **The effect of SIGI on LFP (OLS and IV estimations)**

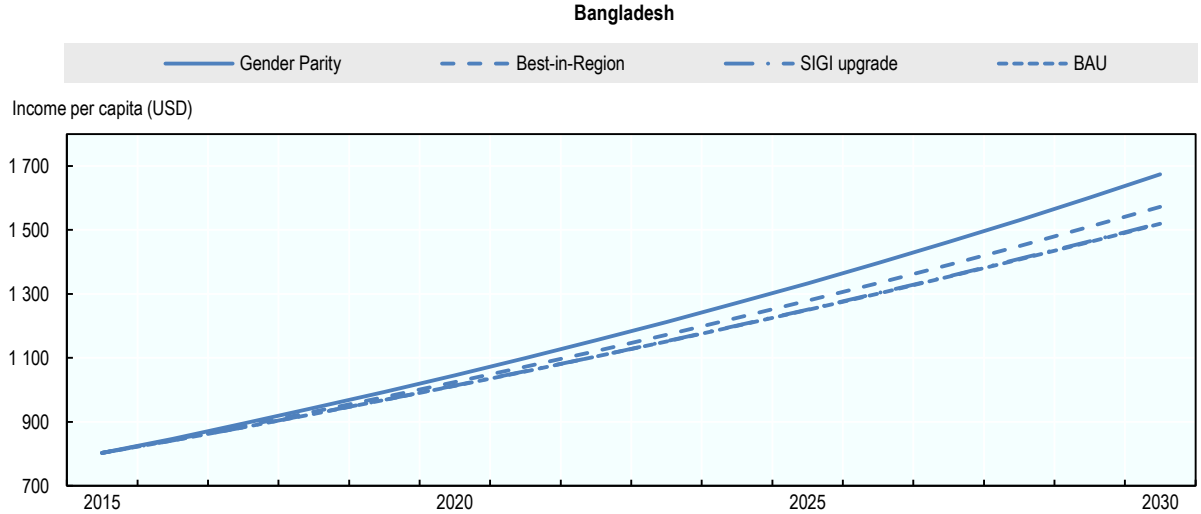
	OLS			IV		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
			Dependent variable = LFP			
SIGI	-0.304**	-0.193**	-0.166**	-0.180**	-0.149**	-0.121**
	(0.126)	(0.087)	(0.083)	(0.085)	(0.071)	(0.057)
Latitude		0.461**	0.914**		0.020**	0.069**
		(0.210)	(0.415)		(0.009)	(0.031)
Landlocked		-0.174**	-0.499**		-0.136**	-0.898**
		(0.079)	(0.227)		(0.062)	(0.408)
Rule of law		0.366**	0.588**		0.256**	0.842**
		(0.166)	(0.267)		(0.116)	(0.383)
Ethnic fractionalisation		-0.610**	-0.165**		-0.460**	-0.428**
		(0.277)	(0.075)		(0.209)	(0.195)
Religion			-0.239		-0.338	-0.886
			(0.546)		(0.464)	(0.718)
Oil		-0.500	-0.999		-0.159	-0.085
		(0.400)	(0.780)		(0.256)	(0.242)
Natural resources		-0.372	-0.132		0.102	0.006
		(0.450)	(0.088)		(0.301)	(0.285)
Openness		0.144**	0.678**		0.082*	0.072*
		(0.068)	(0.308)		(0.045)	(0.041)
Inflation		3.350	9.638		-0.305	-0.297
		(0.000)	(0.000)		(0.263)	(0.267)
Education		0.333***	0.747***		0.438**	0.806**
		(0.110)	(0.240)		(0.195)	(0.335)
GII		-0.035*			-0.320	
		(0.019)			(0.534)	
Gender gap in education			-0.153*			-0.898*
			(0.085)			(0.466)
Constant	1.735***	1.644***	4.303***	1.541***	1.060***	1.608***
	(0.848)	(0.111)	(0.852)	(0.158)	(0.042)	(0.080)
Adjusted R2	0.34	0.67	0.67	0.41	0.71	0.71
N	108	22	22	57	47	47

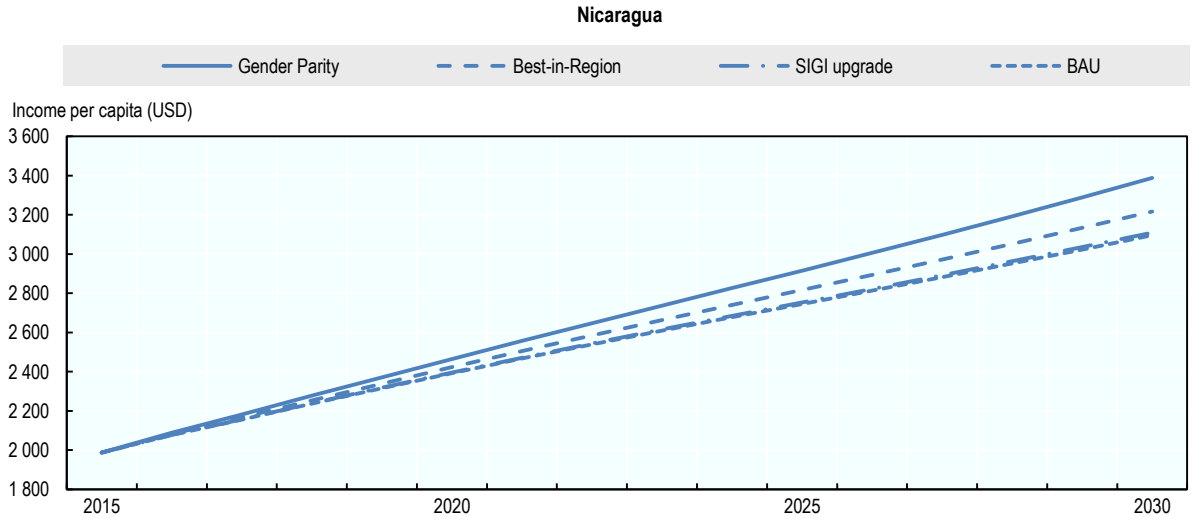
Notes: Absolute robust standards errors are in parentheses.* significant at 10% level, ** significant at 5% level, *** significant at 1% level. For the sake of brevity, only the variables of interest are presented. Additional controls are income groups in 2000 as convergence terms, latitude, landlocked, rule of law, civil liberties, population size, trade openness, inflation, oil, natural resources, urbanisation rates, life expectancy, fertility, ethnic fractionalisation, religion, unemployment rates, total level of education, gender gap in education and regional dummy variables

© OECD 2016

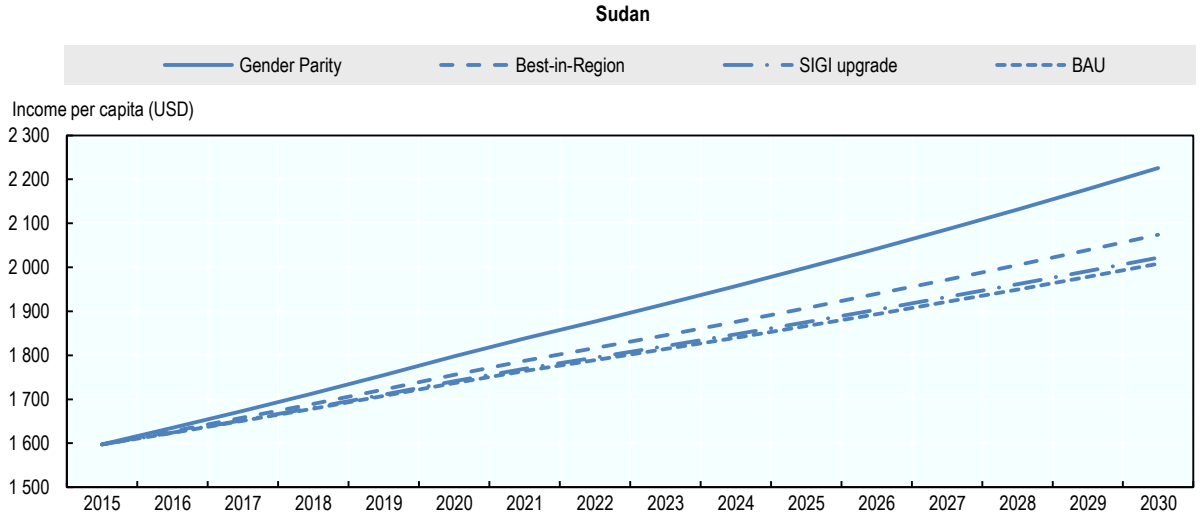
Annex I. Effect of reducing gender-based discrimination in social institutions on GDP per capita 2015-2030 for regional lowest performers

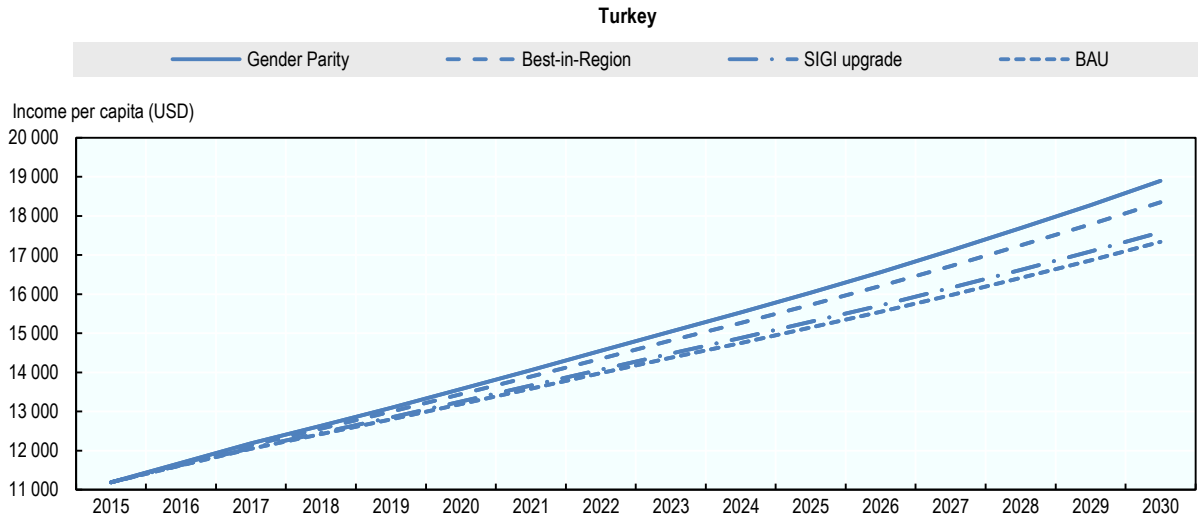


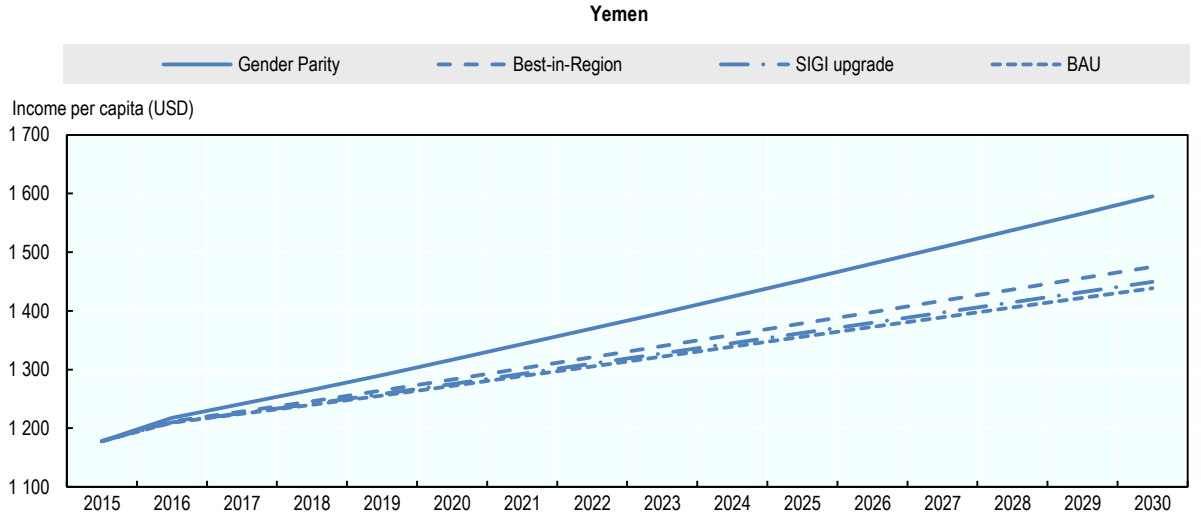




© OECD 2016


Sudan
Gender Parity
Best-in-Region
SIGI upgrade
BAU
Income per capita (USD)
2 300
2 200
2 100
2 000
1 900
1 800
1 700
1 600
1 500
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030


Turkey
Gender Parity
Best-in-Region
SIGI upgrade
BAU
Income per capita (USD)
20 000
19 000
18 000
17 000
16 000
15 000
14 000
13 000
12 000
11 000
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030


Yemen
Gender Parity
Best-in-Region
SIGI upgrade
BAU
Income per capita (USD)
1 700
1 600
1 500
1 400
1 300
1 200
1 100
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030

© OECD 2016

OTHER TITLES IN THE SERIES/ AUTRES TITRES DANS LA SÉRIE

The former series known as "Technical Papers" and "Webdocs" merged in November 2003 into "Development Centre Working Papers". In the new series, former Webdocs 1-17 follow former Technical Papers 1-212 as Working Papers 213-229.

All these documents may be downloaded from:
www.oecd-ilibrary.org/development/oecd-development-centre-working-papers_18151949

or obtained via e-mail (dev.contact@oecd.org).

Recent working papers:

Worling Paper No. 329, *Mind the skills gap! Regional and industry patterns in emerging economies*, by Angel Melguizo and José Ramón Perea, January 2016.
Working Paper No. 328, *Income mobility in times of economic growth: The case of Viet Nam*, by Ian Brand-Weiner and Francesca Francavilla, December 2015.
Working Paper No. 327, *Explaining diversification in exports across higher manufacturing content – what is the role of commodities?*, by Jan Rieländer and Bakary Traoré, September 2015.
Working Paper No. 326, *How do female migration and gender discrimination in social institutions mutually influence each other?*, by Gaëlle Ferrant and Michele Tuccio, March 2015.
Working Paper No. 325, *Measuring Well-Being and Progress in Countries at Different Stages of Development: Towards a More Universal Conceptual Framework*, by Romina Boarini (OECD Statistics Directorate), Alexandre Kolev (OECD Development Centre) and Allister McGregor (Institute of Development Studies, University of Sussex), November 2014.
Working Paper No. 324, *On the effectiveness of exchange rate interventions in emerging markets*, by Christian Daude, OECD; Eduardo Levy Yeyati, Universidad Torcuato Di Tella and Arne Nagengast, Deutsche Bundesbank, September 2014.
Working Paper No.323 , *Public Financial Management in Infrastructure in Africa*, by Nana Boateng (CABRI), Marie Castaing Gachassin (University of Paris 1 Panthéon-Sorbonne), Emilie Gay (CABRI) and Laura Recuero-Virto (OECD Development Centre), July 2014.
Working Paper No.322, *The Political Economy of Tax Incentives for Investment in the Dominican Republic: "Doctoring the Ball", by* Christian Daude, Hamlet Gutierrez and Ángel Melguizo, June 2014.
Working Paper No. 321, *Productive capabilities: an empirical investigation of their determinants*, by Christian Daude, Arne Nagengast and Jose Ramón Perea, December 2013.
Working Paper No. 320, *Capital Flows in Asia-Pacific: Controls, Bonanzas and Sudden Stops*, by Margit Molnar, Yusuke Tateno and Amornrut Supornsinchai, September 2013.