Economic benefits of gender equality in the European Union

Literature review: existing evidence and methodological approaches

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The European Institute for Gender Equality is an autonomous body of the European Union, established to contribute to and strengthen the promotion of gender equality, including gender mainstreaming in all EU policies and the resulting national policies, and the fight against discrimination based on sex, as well as to raise EU citizens' awareness of gender equality.

Further information can be found on the EIGE website (http://eige.europa.eu).

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Foreword

Gender equality is one of the founding pillars of the European Union and much progress has been made over the years to improve the everyday lives of women and men, especially with the creation of more equal opportunities. EIGE's Gender Equality Index demonstrates a positive trend of development in the domain of employment, reflecting the EU's focus on economic and labour market policy. However, large gender gaps persist when comparing educational attainment, pay and income, labour market activity rates and the provision of unpaid work and distribution of time between women and men.

Lower wages and employment prospects for women also increase their risk of poverty or social exclusion, especially later in life when they are dependent on a pension that relies on previous earnings. When it comes to education, women are largely missing from STEM (Science, Technology, Engineering and Mathematics) fields, which have promising job prospects at present and in the future. In short, women's talents are not being used to the full, which is putting a strain on individuals, employers and the society at large.

The European Institute for Gender Equality has produced sound evidence that confirms improvements to gender equality will generate economic growth for the EU and benefit individuals and society at large. We looked at the economic impacts of reducing gender inequalities in STEM education, labour market activity and pay. We also considered the demographic changes when these gender gaps are reduced and a more equal distribution of unpaid care work is achieved.

Our findings prove that more gender equality boosts economic growth. The evidence confirms that improvements to gender equality would generate more jobs for the EU – up to 10.5 million additional jobs by 2050. Gross Domestic Product (GDP) per capita would also be positively affected and could increase up to nearly 10% by 2050. Another important finding shows that addressing different gender inequalities together is likely to generate more positive impacts, rather than tackling them one by one in isolation.

From a methodological point of view, this study is unique in the EU context. It is the first of its kind to use a robust econometric model (E3ME macroeconomic model) to estimate the macroeconomic benefits of gender equality in a broad range of policy areas.

The study shows that promoting gender equality and mainstreaming the different perspectives of women and men into the policy areas of education, labour market participation and pay, among others is essential not only for reasons of social justice and fairness but it is also essential for smart, sustainable and inclusive growth. Structural changes are necessary to avoid permanent losses in wealth and sluggish growth rates and to put the European economy back on an upward sustainable growth path.

On behalf of the Institute and its team, I would like to thank all the experts, researchers and my colleagues at EIGE who contributed to this publication.

Virginija Langbakk
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The European Institute
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Introduction

Introduction

In 2015-2016, the European Institute for Gender Equality commissioned research to assess how improvements in gender equality can contribute to sustainable, inclusive and smart economic growth of the EU. This study is unique in the EU context, as it uses a robust econometric model to estimate economic impacts of improved gender equality in several broad areas such as education, labour market activity and wages. It also considers the demographic impact of such improvements. There has been no previous study that attempted econometric modelling of such a broad range of potential impacts of improved gender equality in the EU.

Main findings of the study

Gender equality and equal opportunities in the labour market have improved over recent decades as a result of legislative, social and cultural changes towards women in the labour force. However, there are still large persistent gender gaps between women and men when comparing their educational attainment, income and wage rates, labour market activity rates and provision of unpaid care work and distribution of time.

The results of the modelling ([1]) show that encouraging more active participation of women in the labour market and increasing their attainment in STEM (Science, Technology, Engineering and Mathematics) education would have a largely positive effect on GDP per capita and on employment of women. The positive impacts are due to an increase in productivity and an improvement to the potential productive capacity of the economy.

In sum, the study results show that higher gender equality would lead to a large increase in the number of jobs that would benefit both women and men. There would be up to 10.5 million additional jobs in 2050 due to improvements in gender equality, with about 70 % of these jobs taken by women. The study further shows that improving gender equality has strong, positive GDP per capita impacts that grow over time. The results show a positive impact of gender equality measures on economic growth due to more women in STEM education, higher labour market participation of women and a lower gender pay gap.

The study demonstrates that there is a clear need to introduce gender equality measures as soon as possible, in the key policy areas of education and employment, in order to achieve sustainable socio-economic development and growth. The study forecasts an improvement on employment rates as early as 2020, and the strongest impact on labour market participation and GDP per capita across the EU in the medium (2030) and long term (2050).

The GDP impacts of gender equality policies compare well against impacts of other labour market and education policies, making gender equality a highly relevant policy measure to promote economic growth. Moreover, the results also show that increased gender equality will help to improve employment, address productivity challenges and population ageing issues in the EU.

Putting gender equality at the heart of the follow-up strategy of Europe 2020 and other policy reforms, such as the European Pillar of Social Rights, would make the economic system inclusive, enabling women to fulfil their full potential, and hence benefiting women and the whole society. This would enable the EU to achieve smart, sustainable and inclusive economic growth.

Higher gender equality would lead to:

- Between 6.3 million and 10.5 million additional jobs in 2050 due to improvements in gender equality by addressing gender segregation in educational choices and increasing the participation of women in STEM, with about 70 % of these jobs taken by women.

- An increase in employment productivity and in the potential productive capacity of the economy as a result of addressing the under-representation of women in sectors with skill shortages and good employment prospects such as STEM.

- Positive GDP per capita impacts that grow over time. Improving gender equality would contribute to an increase in GDP per capita of up to 9.6 % in 2050 in the EU.

- Individual gains up to 12 % increase in GDP per capita by 2050 in EU Member States with lower gender equality ([2]) if gender equality measures were implemented.

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[1]   For a full description of the study results, please see European Institute for Gender Equality (EIGE) (2017), *Economic Benefits of Gender Equality in the European Union: Report on the empirical application of the model*, available at http://eige.europa.eu/sites/default/files/documents/mh0217174enn_web.pdf

[2]   Based on current levels of gender equality as measured by EIGE's Gender Equality Index.

Resources resulting from the study

Besides the present publication, the outputs of this study include eight additional publications, the content of which is summarised below:

The outputs of the study include nine publications:

1. Literature review: existing evidence on the social and economic benefits of gender equality and methodological approaches

2. EU and EU Member States overviews

3. Report on the empirical application of the model

4. How the evidence was produced: briefing paper on the theoretical framework and model

5. How the evidence was produced: factsheet on the theoretical framework and model

6. Economic impacts of gender equality in the EU policy context: briefing paper

7. Economic impacts of gender equality: briefing paper

8. How gender equality in STEM education leads to economic growth: briefing paper

9. How closing the gender labour market activity and pay gap leads to economic growth: briefing paper

This publication includes a summary of the literature on gender equality reviewed at EU and Member State levels. The review can be divided into three parts, whereby the first part includes research studies that either theoretically or empirically examine the economic impact of gender equality. In this first part, the review includes sections on theoretical studies focusing on the analysis on the contribution of gender equality to economic growth. The summary further includes a few empirical studies that attempt to quantify the causal effect of different forms of gender inequalities on the economic growth.

In the second part, the publication includes a review of studies that analyse the economic benefits of gender equality in different policy areas, including:

■ gender equality in education;

■ gender equality in labour market participation;

■ reducing gender earnings gap;

■ women's leadership in firms;

■ women in politics;

■ ending violence against women.

Further sections analyse literature on gender equality, social reproduction and care and unpaid work, as well as on the impact of health inequalities on economic outcomes.

Building on the results of the literature review at EU and Member State levels the study team selected five methodological examples to be reviewed more indepth and explored how they compare to the E3ME model and can inform the subsequent phases of the study. A short list of examples was developed based on several criteria focusing on added value in terms of methodology and learning effects. The selected examples were analysed in depth and the findings were presented in a standardised template. This analysis is published as an annex to the summary of the literature review.

1.
Summary of the literature review

1.1. Introduction

Gender equality is explicitly recognised as a human right and a prerequisite for human development [3].

Promoting gender equality is necessary not only for reasons of social justice and fairness; it also represents an economic necessity for achieving efficiency and growth. As clearly addressed by UN Secretary General Ban Ki Moon at the commemoration of the 2008 International Women's Day: 'Investing in women is not only the right thing to do. It is the smart thing to do. I am deeply convinced that, in women, the world has at its disposal, the most significant and yet largely untapped potential for development and peace. Gender equality is not only a goal in itself, but a prerequisite for reaching all the other international development goals, including the Millennium Development Goals' [4].

There is an increasing consensus on expanding the perception of gender equality from being only a social goal to a wider one including economic aspects. Consequently, the debate about the potential benefits of gender equality has broadened and incorporated the potential economic implications of gender equality. As stated by former Commissioner Viviane Reding, 'the economic case for getting more women into the workforce and more women into top jobs in the EU is overwhelming … We can only reach our economic and employment goals by making full use of all our human resources — both in the labour market as a whole and at the top. This is an essential part of our economic recovery plans' [5].

Bettio and Smith (2008) assert that the 'Economic Case', which stresses the impact of gender quality on growth, has to be seen as a step further on from the so-called 'Business Case' for gender equality. The latter relates to the firm level and emphasises the benefits for employers and managers, which stem from granting equal treatment to employees and a more gender-balanced workforce. The 'Economic Case' for gender equality in turn highlights the potential benefits of increasing gender equality which go beyond the micro level (individual firms and workers) and materialise at the macro level (wider economy).

1.2. Theoretical approaches: mainstream economics and alternatives

The analysis of the link between gender equality and economic growth is part of a wider renewed interest in the theoretical and empirical analysis on economic growth. However, in this strand of literature there are comparatively few studies that explicitly consider the role of gender equality in connection with economic growth (Klasen, 1999). The literature on the link between economic growth and gender equality can be divided into two main groups: the analysis on the contribution of gender equality to economic growth, and the reverse analysis of the effect of economic growth on gender equality. For the purpose of this project, we will focus on the first group of studies [6], i.e. those studies that extend the focus from gender equality as a human right and a social goal to gender equality as an ingredient of economic growth.

Most of the existing economic literature on the link between gender equality and growth is rooted in the standard economic theoretical frameworks based on rational individual choices and market equilibrium. Gross domestic product (GDP) per capita is the most commonly chosen measure of economic growth.

Yet, this theoretical economic framework has been criticised for being too narrow when analysing countries' development and growth and the link between gender-related aspects and growth. One critique lies in the choice of GDP for measuring societies' growth, and argues for the use of more gender-sensitive measures able to encompass a wider definition of economic progress (Bettio and Mark, 2008). GDP does not include household work (domestic tasks such as cooking and cleaning, child rearing and other care responsibilities, etc.), an area where women play a predominant role. According to the latest Eurofound data, women spend an average of 26 hours on caring activities, compared with the 9 hours spent by men. Even though men devote more time to paid work (41 hours, compared with 34 hours spent by women), when considering both paid and unpaid work, data show that women work longer hours than men: 64 hours a week compared to the 53 hours worked by men.

It is thus arguably important to provide a monetary value to unpaid work. Marilyn Waring's seminal and influential work *If women counted: a new feminist economics* (1989) helped pioneer the feminist critique of mainstream economics for ignoring the unpaid work that women do, even though this is essential for sustaining economies. The book explored what would have to change in economic statistics and economic policy to make what women do really count.

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[3]   Beijing Conference of 1995.

[4]   Quoted in Kabeer and Natali (2013).

[5]   European Commission, *Progress in gender equality leads to economic growth, says European Commission report* (press release), 2012, available at: http://europa.eu/rapid/press-release_IP-12-371_en.htm?locale=en

[6]   Reviews of the literature on the link between economic growth and gender equality, with causality going from economic growth to gender equality, can be found in Cuberes and Teignier-Baqué (2011, 2014) and in Kabeer and Natali (2013).

Many efforts have been made since to include unpaid work in national accounts statistics and in GDP. Goldschmidt-Clermont (1982) was the first study that focused on the evaluation methodology of unpaid household work. The author considers unpaid work evaluations based on volumes of inputs or outputs. Input evaluation is based either on the opportunity cost of the time spent in unpaid work i.e. the individual hourly wage or considering the market alternative's cost. Output evaluation requires the identification of the market goods and services equivalent to the ones produced at home (Antonopoulos, 2009). More recent studies on Organisation for Economic Cooperation and Development (OECD) countries show that between one third and half of all valuable economic activity is not accounted for in the traditional measures of well-being, such as GDP per capita (Miranda, 2011). In all OECD countries, women do more unpaid work than men and, at an aggregated level, they do less market work. While unpaid work — and especially the gender division of unpaid work — is to some extent related to a country's development level, country cross-sectional data suggest that demographic factors and public policies tend to exercise a much larger impact (OECD, 2009, OECD, 2011).

One of the first economic analyses of the allocation of time between genders within the household dates back to Becker (1965). Becker used the idea of comparative advantage to argue that the traditional division of labour within the household is efficient due to women's lower wages in the labour market and biological advantage in childcare. Moving from these first theoretical approaches, subsequent works, in particular the **extended and reproductive macroeconomic approach** developed by Picchio (1992), have attempted to include household production in economic analyses. This approach includes the process of social reproduction among the structural processes of production, distribution and exchange. It explicitly acknowledges the importance of unpaid domestic and care work for the reproduction of societies.

In the classical approach of demand and supply, labour is seen as a commodity and thus has a price. However, the process behind the creation of labour cannot be disentangled from the labour force. What makes labour different from other commodities is the reproduction cost, which is ruled out by the traditional demand and supply mechanism. The reproduction value of labour is intertwined with every commodity: in fact, no commodity could have been produced without labour, which in turn, needs wage to produce commodities. The process of production and the process of reproduction of labour are therefore intertwined.

Secondly, the aggregate measure of GDP ignores the differences between women and men and their unequal living conditions. In this context, a very useful framework is Sen's **capabilities approach** (Sen, 1985, 1992, 1999, 2009), which shifts the focus from gender equality as equality in resources and means to gender equality as equality of opportunities in the **well-being domain**. This approach recognises that well-being is a multidimensional concept, and that it cannot be assumed that all women and men access and use resources in the same way. Sen underlines that the welfare of individuals and societies should not be measured by income, expenditure or consumption, but that it should be based on capabilities. He distinguishes between functionings and capabilities. Functionings are beings and doings. For instance, to have a job, to be fed or to have an education are considered as functionings. Capabilities are instead notions of freedom (they can be compared to opportunity sets), and they represent all the potential functionings an individual can choose from. Sen's work is the basis of the Human Development Index (United Nations Development Programme (UNDP), 2015) and the basis of the report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz et al., 2008), generally referred to as the Stiglitz-Sen-Fitoussi Commission [7].

Another shortcoming of the economic literature, which arises when gender equality aspects are analysed, is the notion of the 'Rational Economic Man'. Neoclassical economic theory is in fact based on the behaviours of rational, representative male agents with their own preferences and tastes that do not depend on external circumstances. This concept is, however, very difficult to apply to women with children or caring roles (Bettio and Smith, 2008). In fact, as Duncan and Edwards (1997) have pointed out, economic rationality may be determined by non-market criteria about what is socially right, and may be influenced and changed by the context in which women and men find themselves. They thus argue that preferences and tastes are collective and gendered, rather than individual and gender-free, and introduce the concept of 'gendered moral rationality'.

Similarly, the concept of the household as a unique entity where decisions are taken consensually has been criticised by the so-called 'household bargaining approach'. This approach, developed in particular by Chiappori's collective models (1988 and 1997), considers that decisions are taken within a 'non-unitary' framework. Thus, specialisation between a household's components may be a risky strategy in case of unexpected events (e.g. divorce, premature death). The limits of the 'unitary' household model are not only apparent in the area of academic research, but are also clear from a policy point of view. Assuming a unitary model, resources may be directed to only

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[7]   The Stiglitz-Sen-Fitoussi Commission is a commission of inquiry created by the French government in 2008. The inquiry examined how the wealth and social progress of a nation could be measured, without relying on the unidirectional GDP measure. The commission was formed in February 2008 and Joseph E. Stiglitz was named as the chair. Amartya Sen was the economic adviser and the French economist Jean-Paul Fitoussi was the coordinator.

(male) household heads, ignoring intra-household inequality. The household bargaining approach tries to incorporate the social reality of the family, proposing different alternatives to possible interactions within the household. Within this approach, a range of alternative models, mostly based on game theory, are used to describe intra-household dynamics: cooperative, non-cooperative, collective, mixed. However, agreement on what kind of interactions are prevalent in the household has not yet been reached, although there is a wide consensus on the fact that intra-household interactions are characterised by elements of both cooperation and conflict (Agarwal, 1997) [8].

Finally, the static view of households with preferences fixed in time has been questioned by 'life-course approach' proponents. They stress that it is necessary to bring to light the changes of interests and preferences over time and the interactions of the group of individuals that comprise a household (Ketzer, 1986, 1991). This aspect is particularly true when considering gender inequalities affected by life-course events such as family formation, separations and ageing.

1.3. Empirical studies

On the empirical front, there are some studies that attempt to quantify the causal effect of different forms of gender inequalities on economic growth. However, as pointed out by Cuberes and Teignier (2013), the empirical literature in this field is not well connected to the existing theoretical frameworks, because these frameworks are not easy to translate into an empirical investigation.

Empirical studies may be categorised according to whether they seek a direct or indirect effect of gender equality on economic outputs. The **direct effect** derives from the better use of the human resources of the economy. If skills and abilities are equally distributed among genders, the failure to make full use of women's ability and talent represents a waste of the human capital potential of the economy, lowering average productivity and growth. These studies, which have benefited from the recent development of cross-country international data sets, mainly analyse the impact of gender inequalities on macroeconomic outputs and in some cases try to quantify the cost of gender inequality, or conversely, gains in terms of economic output that could be achieved in the case of gender equality.

Although acknowledging its limitations, the existing empirical literature typically chooses changes in GDP per capita (or other macroeconomic variables such as investment, (un) employment, etc.) as the main indicator of the economic

outcomes of changes in gender equality. This relates to the fact that GDP is a widely used and harmonised measure that allows for easy cross-country comparisons — there is no other alternative for measuring economic progress that would be so widely accepted [9].

The second strand of existing empirical studies focuses on the **indirect economic effect** of gender inequality. It relates to the positive externalities generated by greater gender equality on household decisions, including fertility, higher educational attainment of children, and allocation of household income. Such studies explore the potential link between the gender gap and variables that may have an effect on economic growth. They are mainly empirical studies on the causes and consequences of different aspects of gender inequality in a specific country. As they are mainly country-specific, extrapolating their results to wider policy implications may often be inadequate (Bandiera and Natraj, 2013).

Education and the labour market are the two main **areas** where greater gender equality is likely to impact economic outputs through many different channels.

In the first case, studies have focused on the gender gap in **education** and the gains that a reduction in such a gap could bring to the economy. Scholars have particularly analysed the role that increasing women's and girls' educational attainment can have on developing countries' growth. However, the positive effects of reducing the gender gap in education have also been found in developed countries, although they are typically smaller. For instance, despite the fact that women's performance and participation in tertiary education exceeds that of men in most EU Member States, considerable gender inequalities are still identified in research. Women are less likely to choose STEM fields of study at graduate and postgraduate level, resulting in lower employment prospects and lower wages.

The second main channel works by reducing gender inequality in **labour market** outcomes. Here, the three main aspects that have been investigated are: (i) the increase in women's **labour market participation**; (ii) the role of the **gender wage gap**; and (iii) gender equality in **economic decision-making**.

Other existing researched pathways include the benefits of a more equal sharing of **social reproduction**, the **empowerment of women in political and economic decision-making**, and the costs for societies of the gender gap in **health** and **gender-based violence**.

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[8]   For a further elaboration on this concept, see sections 2.3 and 2.4 on the wage gap and unpaid work.

[9]   There are few examples that attempt to integrate unpaid work into neoclassical economic models and analyses. Picchio (2003) introduces the concept of total work, i.e. the sum of paid and unpaid work, and extended income, i.e. the sum of money income and services derived from unpaid work, to bring out crucial differences between women and men in the family and in the market.

1.4. Methods used in the empirical literature

1.4.1. Regressions analysis

The most commonly used tool for the estimation of the causal direct economic effect of gender (in)equality is regression analysis (cross-section, panel data, or both). Typically, (variations in) countries' growth rates of per capita income are regressed on a set of standard growth variables that include (variations in) different measures of gender inequality.

This estimation can be interpreted as causal effects of gender equality on economic outputs if a number of methodological aspects are correctly addressed.

First of all, the variation in gender equality must be exogenous to the analysed economic output. This might not occur in case of reverse causality i.e. when gender equality is generated by economic growth, or because gender equality is correlated with other factors that affect economic growth (spurious correlation) which are not included in the analysis.

A second possible limitation of regression analysis relates to the possibility of extending the validity of a result in one context (country, period of time) to other samples. The issue of external validity arises when the analysis fails to detect the mechanism through which gender gaps affect economic growth. In this case, the extrapolation of results from the analysed situation to other settings may not be valid.

Furthermore, constraints in the availability of data may generate measurement errors or the impossibility of adequate controls for composition and selection effects ([10]).

Most of these shortcomings have been addressed by the literature, which has also proposed a range of possible solutions. A summary of possible strategies to overcome regression analysis biases, together with the limits in their implementation, is presented in the table below (Table 1.1).

1.4.2. Macro modelling approaches

The complexity of studying a multidimensional phenomenon such as gender equality led to the development and implementation of modelling approaches in which some patterns that are identified at micro level are translated into a macroeconomic framework. This approach makes it possible to take into account the effects of improving gender equality on the economy, along with other elements that are related to the behaviour of individual agents at microeconomic level such as educational choices, entry in the labour market, and household formation. There are different modelling approaches that offer alternative interpretations of how the economy operates: dynamic micro-simulation models in which each individual in a given initial population is evolved through time according to estimated transition probabilities; Computational General Equilibrium (CGE) models that are more theoretical and assume optimising behaviour among all economic agents; and macro-econometric modelling that is more empirical in nature and assumes a continuation of past trends in behaviour.

An example of the use of the macro modelling approach applied to the gender equality field is the work of Rosetti and Kakande (2010), where a CGE model is used to quantify the contribution of reduced gender inequality in Uganda to GDP growth rates. The study analyses the potential increase in the GDP growth rate by (i) increasing the labour participation of women in more productive activities; (ii) increasing the skills of women; (iii) increasing the productivity of labour provided by women; (iv) increasing the productivity of activities in which women are engaged; and (v) increasing women's access to land. The study confirms the importance of reducing gender inequalities that limit women's potential to improve growth and the poverty reduction prospects of African economies.

1.4.3. Basic assessments

Another approach which exists in the literature aiming at evaluating the economic gains of higher gender equality in societies is the estimation of the effect of full gender equality in the labour market. This approach evaluates what happens if (all or some of) the barriers to women's participation in the labour market are removed and women can participate to the same extent as men and on the same conditions (in terms of occupations, sectors, working conditions, career and productivity). The effect on economic growth is then estimated by computing the impact of the additional labour force in the economy.

This approach may represent a higher bound for the estimation of the economic benefits of gender equality. However, it contains a number of assumptions that would need to be considered.

■ It is based on the hypothetical assumption of the removal of any inequality in labour market access.

■ It implies a completely elastic demand (the economy is able to offer full employment to the additional labour supply).

■ It often computes the additional supply to the labour market while disengaging its gendered nature. In other

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([10]) For instance, Mulligan and Rubinstein (2008) have shown that the major reason for the growth in women's measured hourly wages relative to men's from the late 1970s through to the late 1990s was women's selection into the labour force, their labour force attachment, and their human capital investment.

Table 1.1   Possible approaches to strengthen the robustness of regression analysis

Common biases arising in the regression analysis of economic impact of gender inequality	Example of possible solutions	Limitation
Presence of endogeneity because of reverse causality	Instrumental variables approach with tests for the validity of instruments chosen	Valid instrumental variables are difficult to find because many variables that predict gender equality are also correlated with economic outputs
Presence of endogeneity because of spurious correlations	Inclusion of all relevant variables in the analysis	Data sets may not contain relevant omitted variables
Misidentification of the channel through which gender gaps affect economic growth	System of equation to control for possible different channels; estimation of a reduced form of an underlying complex model	The coefficients may be hard to interpret
Measurement errors due to weak or incomparable data (mostly apply to developing countries' data)	Use of comparable cross-country data; use of country fixed effects in estimations	Availability of data
Inadequate control for composition and selection effect	Use of adequate data; controls for the workforce composition in the estimation	Availability of data
Lack of robustness checks	Use of different measures of gender inequality acknowledging the pros and cons of each of them; careful treatment of outliers' value	Availability of data/statistical feasibility
Multicollinearity	Careful choice of variables to be used in the regression; factor analysis; statistical tests	Lack of data/variables. In case of factor analysis ([9]): impossibility of disentangling the impact of the specific observed variables since they are aggregated in 'factors'. Low power of specific tests

words, the behaviour of women in the labour market is assumed to be equal to that of men. Consequently, an increase in women's participation is considered to have the same effect as an increase in men's participation.

1.4.4.   Evaluation of 'natural experiments'

These are micro-level studies based on randomised controlled trials or the use of natural and field experiments. Examples of studies of this type in Europe include, for instance, studies on the effect that legally imposed gender quotas in companies' board of directors have on firms' performance (see section 2.5 on economic decision-making).

On the one hand, these studies may overcome some of the problems of regressions analysis, in particular those related to endogeneity. The introduction of the quota can in fact be seen as a 'natural experiment' so that an increase in board gender diversity can be seen as an exogenous event. On the other hand, they may raise different concerns when issues relating to the exact timing of the 'shock' brought about by the law and on the control group (similar firms not affected by the shock) are not correctly addressed and taken into account (Ferreira, 2015). ([11])

([11])   In factor analysis, the factors represent unobserved latent variables that affect observed correlated variables.

2.
The economic benefits of gender equality in different policy areas

In what follows, we review the most relevant evidence for the impact of gender equality on different macroeconomic outcomes, highlighting the most important channels through which greater gender equality is likely to affect growth.

This review aims to emphasise those studies where the evidence is more robust and informative for policymakers. To quote Cuberes and Teigner (2011), these are studies that can constitute 'useful tools to answer clear-cut policy questions such as what would be the productivity benefit of making the labour market more accessible and/or fair to women'. Put differently, the studies reviewed here aim at helping us bridge the gap between policymaking and evidence, which is one of the objectives of the present study.

Below is a table summarising the indicators that have been used to measure the economic impact of increasing gender

equality in different areas (i.e. education, labour market participation, gender pay gap, distribution of unpaid work, firms' leadership positions, entrepreneurship positions, and political decision-making) as well as the main evidence from the literature on the economic impact of increased gender equality. These are discussed in more depth in the subsequent sections.

Our review focuses on the micro and macroeconomic gains deriving from enhancing gender equality in the EU. Thus, it concentrates on those studies that have an economic variable as the main outcome of increasing gender equality. However, promoting gender equality produces effects that extend well beyond the economic effects analysed here. These aspects are not addressed in the present study, as they are outside its scope and focus.

Table 2.1   Summary table

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Increasing gender equality in education	**Fertility rate**	NEGATIVE EFFECT/DECREASE ■ Existing evidence suggests that, especially in developing countries, an increase in female education reduces fertility (Barro and Lee, 1994; Brummet, 2008; World Bank, 2011; Klassen, 2009)
	Per capita and total GDP growth rate	NEGATIVE EFFECT/DECREASE (for female education) ■ Barro and Lee, 1994 found that female education was negatively correlated with economic growth. Barro and Lee attribute this to a sign of 'backwardness' in society, where gender differences may be picking up on issues within less developed countries that may not have been captured with an initial GDP variable ■ Lagerlöf, 2003 also found that increasing gender equality in education can lead to reduction in economic growth POSITIVE EFFECT/INCREASE ■ Baliamoune, 2008 found that the gender gap in education has a negative effect on income growth. The study found out that the gender gap in education has a stronger negative effect on growth in Arab countries ■ Brummet, 2008 identified a significant negative impact of the gender gap in education on growth. Similar evidence was provided by Klasen, 2009, who also found that gender gaps in education had a negative impact on economic growth. The regions with the largest gender gaps in education — South Asia, sub-Saharan Africa, and the MENA region — were found to incur the largest losses in terms of economic growth. For instance, the total combined effect (direct and indirect) in South Asia, sub-Saharan Africa and the MENA region was estimated respectively at a 1 %, 0.8 % and 0.7 % annual loss in per capita growth
	Labour productivity	POSITIVE/INCREASE ■ There is some evidence that female education has positive impacts on overall labour productivity, which is more pronounced than in the case of male education (Knowles, Lorgelly, Owen, 2002)

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Increasing gender equality in education	**Life expectancy/family and child health**	POSITIVE/INCREASE ■ The literature also identified other types of social benefits associated with decreases in gender gaps in education, such as reduced infant and child mortality, improvement in family and child health and increase in life expectancy (Barro and Lee, 1994; Schultz, 1988; Behrman and Deolalikar, 1988; Bellew, Raney and Subbarao, 1992; Subbarao and Raney, 1995)
	Investment	POSITIVE/INCREASE ■ Klasen, 2009 found a positive and significant relationship between increased gender equality and education and investment
Increasing gender equality in labour market participation	**Per capita and total GDP growth rate**	POSITIVE EFFECT/INCREASE ■ International level including EU level: • 13 % higher GDP in the euro area, with the elimination of the gender employment gap (Daly, 2007); • 27-29 % higher GDP for EU average with full gender balance on the labour market (Löfström, 2009); • higher GDP ranging from +3 % in Sweden to +19 % in Italy with increasing women's employment rate (Aguirre et al., 2012); • higher GDP growth (+ 1.3 %) with improvement in equality of opportunities (measured by the following indicators: fertility rate, secondary enrolment gap and literacy rate gap) and higher GDP growth (+ 1.19 %) with improvement in equality of outcomes (measured by share of women in parliament and gender gap in labour force participation) (Mitra et al., 2015); • loss in output per worker due to gender inequality in labour market participation (- 40 % when all women are excluded from labour market) (Cuberes and Teignier, 2016); • 8 % increase in the annual rate of GDP growth due to the growth in women's share in formal sector employment (Klasen, 1999); • positive effect on the annual rate of GDP growth due to the growth in women's share of the labour force (magnitude depending on the econometric specification used, Klasen and Lamanna, 2009); • 3.4 % growth in total factor productivity due to the growth in the share of women in the labour force (Loko and Diouf, 2009). ■ Country level: • 0.28 % GDP increase in Italy with +1 % women's employment rate (Casarico and Profeta, 2007); • higher Italian GDP if women's employment rate increases (three different possible scenarios are presented, Zisza, 2008); • 0.3 % annual increase in real GDP in Japan if women's participation rate increases by 9 % (Matsui et al., 1999); • higher GDP in New Zealand if women increase labour force participation (two different possible scenarios are presented, Bryant et al., 2004); • from 2 % to 9 % higher GDP in Latin America by removing gender segregation in occupation (Tzannatos, 1999); • higher per capita income (+ 319 %) by increasing the ratio of women-to-men managers (from 100 % men to 50-50) and higher per capita income (+ 153 %) by increasing the ratio of women-to-men workers (from women being 50 % of the employed to 66 %) in India (Esteve-Volart, 2009).

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Increasing gender equality in labour market participa-tion	**Fertility**	POSITIVE EFFECT/INCREASE ■ Del Boca et al. (2005) show that there is a positive correlation between employment and fertility across EU MS ■ In countries where it is relatively easy for women to work and have children, women's employment and fertility both tend to be higher (Daly, 2007) ■ A more gender equal labour market, welfare system, or households can be accompanied by higher fertility at similar or even higher levels of employment (Smith and Bettio, 2008)
	Investment in health and education of children	POSITIVE EFFECT/INCREASE ■ Higher women's labour market participation increases bargaining power in the household with positive effects on children's human capital (Klasen and Lamanna, 2009; Kabeer and Natali, 2013)
	Additional taxes and social security contributions	POSITIVE EFFECT/INCREASE ■ Higher women's labour market participation increases public revenues (Maier and Carl, 2003)
	Social capital	POSITIVE EFFECT/INCREASE ■ Higher labour market participation increases the opportunities of making social connections and networks at the workplace (Putnam 2000; Norris and Inglehart, 2003; Paugam and Russell, 2000)
	Time devoted by fathers to childcare activities	POSITIVE EFFECT /INCREASE ■ Fathers increase their care-giving time when mothers increase their paid work (Hallberg and Klevmarken, 2003; Sayer et al., 2004; Mancini and Pasqua, 2012)
Reducing the gender pay gap	**GDP growth rate**	POSITIVE EFFECT ON GROWTH ■ No evidence that wage discrimination stimulates economic growth (meta-analysis study, Schober and Winter-Ebmer, 2009) ■ Higher women's wages reduce men's wages only marginally and increase GDP (simulation study on Latin America, Tzannatos, 1999) ■ Wage discrimination discourages women's labour market participation and decreases GDP per capita (theoretical model applied to US data, Cavalcanti and Tavares, 2008) NEGATIVE EFFECT ON GROWTH FOR EXPORT-ORIENTED COUNTRIES ■ Reducing the pay gap reduces economic growth in the short run (study on 20 export-oriented semi-industrialised countries, Seguino, 2000 and 2011)
	Savings rate	POSITIVE EFFECT/INCREASE ■ 1 % increase in the women's wage bill share raises aggregate savings rate by 0.25 % GDP (Seguino and Floro, 2003) ■ Higher women's wages increase saving rates (study on older US individuals, Rossi and Sierminska, 2014) ■ Higher women's wage rates can lead to higher formal savings (Lee et al., 2010)
	Expenditures on goods and services for children/ sustainable goods	POSITIVE EFFECT/INCREASE ■ Women may have a stronger preference than men for spending on goods and services that contribute to the human capital of their children (Stotsky, 2006) ■ Women tend to buy more eco-labelled or organic food, have a higher propensity to recycle, place more value on efficient energy, and pay closer attention to ethical issues in purchases than men (OECD, 2008)

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Increasing gender equality in the distribution of unpaid work	**Women's health**	POSITIVE EFFECT ■ Women's greater hours of unpaid work contribute to women experiencing more stress than men (study on time use data from Canada, McDonald et al., 2005) ■ Equalising gender roles would improve women's health (study on time use data from US, Bird and Fremont, 1991)
	Women's labour market career	POSITIVE EFFECT ■ Paternity leave is correlated with shorter career breaks, longer working hours, fewer penalties in terms of promotions and wages and improved labour market positions for mothers (Pylkkanen and Smith, 2003; Keck and Saraceno, 2013)
	Children's well-being (social, emotional, physical and cognitive development)	POSITIVE EFFECT ■ Fathers' involvement in childcare is positively associated with children's social, emotional, physical and cognitive development (Tamis-LeMonda and Cabrera, 2002; Allen and Daly, 2007; Lamb, 2010)
Increasing availability, affordability and quality of social infrastructure	**Fertility**	POSITIVE EFFECT ■ Family reconciliation policies in the Nordic countries have a positive impact on fertility (Datta-Gupta et al., 2008) ■ Family policies can promote the labour supply of women and more equal role-sharing between mothers and fathers in Denmark and Sweden (Pylkkanen and Smith, 2003) ■ Unequal division of non-paid work within the household, and weak support for combining work and parenthood, reduce fertility intentions (Mills et al., 2008) ■ There is a positive correlation in OECD countries between attitudes supporting gender equality in the work environment and fertility (Mortvik and Spant, 2005) ■ Lower labour market penalties due to childbearing breaks induce higher fertility rates (Adsera, 2004)
	Labour market attachment for mothers	POSITIVE EFFECT ■ Long and well-paid leave and generous provision of childcare services help mothers to remain in paid work (Keck and Saraceno, 2013) ■ Policies that help women to reconcile work and family increase women's employment and reduce employment penalties after motherhood (Pacelli et al., 2013)

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Increasing gender equality in firms' leadership positions	**Firm performance/labour productivity**	POSITIVE EFFECT/INCREASE ■ International level including EU level: • greater women's representation in top positions is associated with 10 % higher rate of return on equity (report on EU companies, McKinsey & Co., 2007); • companies with more women board members experience 53 % higher returns on equity, 42 % higher returns to sales, and 66 % higher returns on invested capital (study on Fortune 500 companies, Catalyst, 2007); • gender-diverse boards are associated with significantly higher firm value (study using data on the Fortune 1000 firms in 1997, Carter et al., 2003); • the proportion of women board members is positively correlated with the rate of return on assets and the rate of return on equity (study on the 500 largest EU firms over the years 2010-2012, Isidro and Sobral, 2015). ■ Country-level academic studies: • top women managers are positively associated with firm profits, value added and revenues (study on 2 500 largest Danish firms for the 1993-2001 period, Smith et al., 2006); • top women managers significantly improve firm financial performance, but only when the firm's strategy is focused on innovation (study on 1 500 US S&P firms, Dezno et al., 2012); • firms with gender-diverse boardrooms are generally associated with increased labour productivity (study on 288 largest Australian firms, Ali et al., 2014); • firms with a higher percentage of women board members are associated with significantly higher firm financial value (study on a sample of Spanish publicly listed companies over the 1995-2000 period, Campbell and Minguez-Vera, 2008); • labour productivity in firms with a woman chief executive officer (CEO) significantly increases with the share of women workers (study on Italian manufacturing firms with at least 50 employees, Flabbi et al., 2014); • women directors working in women-owned firms are associated with significant improvements in the firm's operating profitability (study on Italian family-controlled firms over the 2000-2010 period, Amore et al., 2015). NULL OR NEGATIVE EFFECT ■ Country-level academic studies: • women managers do not significantly impact on firm performance (study on Danish firms with more than 50 employees, Parrotta and Smith, 2013); • women board members do not significantly affect corporate performance, (study on United Kingdom (UK) listed firms over the 1996-2011 period, Gregory-Smith et al., 2013); • women board members are not significantly associated with Tobin's Q ([10]) (study on a sample of listed Danish firms during the 1998-2001 period, Rose, 2007); • increased women's representation in the board of directors significantly reduces Tobin's Q and operating firm performance (study on the Norwegian law on gender quota in boards, Ahern and Dittmar, 2012); • gender-diverse boards are generally associated with lower firm financial performance (study on a sample of US firms for the 1996-2003 period, Adams and Ferreira, 2009).

([12])   The Tobin Q ratio is calculated as the market value of a company divided by the value of the firm's assets.

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Increasing gender equality in firms' leadership positions	Firms' employment	POSITIVE EFFECT ■ Firms with increasing share of women on boards are significantly less likely to undertake workforce downsizing (study on firms affected by the Norwegian law on gender quotas on boards, Matsa and Miller, 2014) ■ Firms owned by women are significantly less likely than firms owned by men to downsize their workforce (study on privately owned US firms in the 2006-2009 period, Matsa and Miller, 2013)
	Women's wage/gender wage gap	POSITIVE EFFECT ■ Women with wages above the median earn on average more when working for a woman CEO than for men CEOs (+ 7.8 % in the benchmark specification) (study on Italian manufacturing firms with at least 50 employees, Flabbi et al., 2014) ■ Women-owned firms are associated with a reduction in the gender wage gap by 1.5 % (study on Portugal covering the 1987-2000 period, Cardoso and Winter-Ebmer, 2010) NULL EFFECT ■ No evidence that increases in the proportion of women board members has contributed to narrowing the gender wage gap (study on firms affected by the Norwegian law on gender quotas on boards, Bertrand et al., 2014)
	Women's career advancements	POSITIVE EFFECT ■ Increasing women's leadership helps the career advancements of women in the lower echelons of the firm (study on white-collar workers of more than 4 000 Norwegian firms, Kunze and Miller, 2014)
	Gender awareness	POSITIVE EFFECT ■ Women top managers and working proprietors are associated with firms that are more prone to provide childcare facilities and mentor women junior staff (study on Germany, Gagliarducci and Paserman, 2015) ■ Women leaders are more gender-sensitive than men leaders (study on the US, Tate and Yang, 2015)
Increasing gender equality in entrepreneurship positions	Aggregate productivity and income per capita	POSITIVE EFFECT ■ Loss in output per worker due to gender inequality in entrepreneurship (- 10 % when all women are excluded from entrepreneurship) (Cuberes and Teigner, 2015)

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact

Increasing gender equality in political decision-making	**Policies concerning social issues**	POSITIVE EFFECT/INCREASE
		■ Country-level studies with loose control on endogeneity:
		  • a larger fraction of women in politics is associated with a significantly higher degree of activity when it comes to issues relating to women, children and families (study on members of the lower houses of 12 US state legislatures in 1988, Thomas, 1991);
		  • women are found to have more gender-sensitive policy priorities (study on members of the lower houses of 12 US state legislatures in 1988, Thomas and Welch, 1991);
		  • child support enforcement policies are higher in states with a high number of women legislators (study on US states for the 1978-1991 period, Case, 1998);
		  • higher fraction of women legislators is significantly and positively related with expenditure on family assistance per capita, and the degree of child support enforcement (study on 48 continental US states over the 1950-1999 period, Besley and Case, 2003).
		■ Country-level studies with endogeneity controls/addressing causal interpretation:
		  • a greater share of women in local municipalities is associated with a significant increase in the expenditure on childcare and the care of the elderly (study on Swedish local councils, Svaleryd, 2002);
		  • women legislators are found to have a positive impact on policies investing in health and early education, to favour gender-sensitive laws, and to support redistributive policies (study on 16 larger states in India, Clots-Figueras, 2011).

	Functioning of the government	POSITIVE EFFECT/INCREASE ■ Women politicians are more likely to cooperate (Paxton and Hughes, 2007) ■ Women politicians are more likely to propose new and creative solutions to problems (study based on interviews with women politicians of the Thai parliament, Iwanaga, 2008)
	Corruption	POSITIVE EFFECT/DECREASE ■ Higher shares of women politicians are associated with significantly lower levels of corruption (study on a sample of more than 100 countries, Dollar and Gatti, 2001) ■ Women are significantly more adverse to corruption and tax evasion (Torgler and Valev, 2010; World Bank, 2001; Swamy et al., 2001; Beamen et al., 2009)
	Level of education of politicians	POSITIVE EFFECT/INCREASE ■ Gender quotas in elections significantly increase the years of schooling of politicians (study on Italian local municipalities in 1993-1995, Baltrunaite et al., 2014)
	Gender stereotypes	POSITIVE EFFECT/REDUCTION ■ Gender quotas can be helpful in breaking down negative stereotypes against women (study on Italian local municipalities, De Paola et al., 2010)

Gender equality area	Indicator used to measure the economic impact of increasing gender equality	Evidence of economic impact
Reducing the gender gap in health	**Different labour market outcomes**	■ Health has an impact on most labour market outcomes: wages, labour force participation, hours worked, retirement, job turnover. However, there is a lack of studies that analyse gender differences in labour market behaviour as a response to health shocks (Currie and Madrian, 1999). POSITIVE EFFECT/REDUCTION ■ Health affects exit out of and entries into employment, with higher impact on women than men, Gomez et al., 2010) ■ Improved maternal health increased labour force participation of married women during the 20th century and generated a rise in income per capita of over 50 % via this channel (Albanesi and Olivetti, 2009) ■ Access to oral contraception has a positive effect on women's education, career, labour force attachment and earning, and on long-run outcomes of children born (Goldin and Katz, 2002; Hock, 2008; Ananat and Hungerman, 2012; Bailey, 2006; Bailey et al., 2012; Albanesi and Olivetti, 2015)
	Fertility/marital stability	POSITIVE EFFECT ■ Reduction in maternal mortality increased fertility and women's human capital in 25 advanced and emerging economies between 1900 and 2000 (Albanesi, 2012) ■ Reduction in maternal mortality increased fertility in US states (Albanesi, and Olivetti, 2014) ■ Access to oral contraception has a positive effect on marital stability (Zuppan, 2012)

2.1. The economic benefits of gender equality in education

2.1.1. Background

2.1.1.1. Gender gap in education in the EU

Women's performance and participation in tertiary education and lifelong learning exceeds that of men in most of the EU Member States according to Eurostat data. Yet, this advantage fails to materialise on the European labour market. According to Eurostat, as of 2015, 16.7 % of women in the EU aged 15-29 were NEETs (Not in Education, Employment or Training), compared to 13 % of men aged 15-29.

One of the reasons for this may be that young women can often be encouraged to choose degrees, training programmes or apprenticeships that put them in a less favourable position when seeking employment and/or lead them into relatively low-wage occupations ([13]). For instance, recent Eurostat data show that while men graduates with bachelor's and master's degrees in science, mathematics and computing accounted for 13 % of all men graduates in 2012, the same proportion in the female graduate cohort

was only 6 % ([14]). Consequently, the persistence of such differences in the type of education pursued by women and men may lead to occupational segregation and may further reinforce gender stereotypes, resulting in the undervaluation of women's work and suboptimal matching of skills and jobs ([15]).

In the same vein, young women may also face a greater risk of in-work poverty than their male counterparts, a problem that worsened visibly during the recession of the late 2000s ([16]). Indeed, some evidence suggests that reductions in public spending brought about by the economic crisis and related wage and/or job cuts had a particularity severe impact on sectors with a traditionally high ratio of women workers, such as social services and education (Perrons, 2015).

Overall, the gender inequalities in education in the EU are likely to be substantially different from those that are found in developing countries. In many developing countries, women's participation in tertiary education is low compared to that of men and also lags at the level of secondary and

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([13]) Eurofound, *Working poor in Europe*, 2010.

([14]) European Parliament, *Women and Education in the EU*, 2015, available at: http://www.europarl.europa.eu/RegData/etudes/ATAG/2015/551301/EPRS_ATA(2015)551301_EN.pdf

([15]) *Mapping and Analysing Bottleneck Vacancies in EU Labour Markets*. Report for the European Commission, 2014.

([16]) Ibid.

primary education. In contrast, in the EU the participation and performance of women in education has improved and is now high, although it still fails to translate into labour market outcomes, possibly due to gender segregation in education according to specific study programmes and areas.

This means that some of the research reviewed below that focuses specifically on developing countries is likely to be of limited relevance in the EU context. In particular, studies highlighting that increased overall participation rates of women in education result in higher economic growth and reduced fertility are likely to relate mostly to developing countries rather than to EU Member States.

2.1.1.2. Potential channels through which the gender gap in education may affect macroeconomic performance

Although there is a plethora of channels through which changes in the gender gap in education (in particular attainment level) may affect macroeconomic performance, available research most commonly explores the impact of education via the labour market (changes in productivity) on economic growth. Much of the existing cross-country empirical research examines the direct link between the gender gap in education and economic growth, relying frequently on the various versions of endogenous growth models (i.e. variations of the Romer model, which incorporate human capital as a variable affecting economic growth). It is typically assumed that the gender gap in education has an effect on productivity and hence on GDP per capita, which is used as a measure of wealth. Yet, there appears to be no broad consensus among academics regarding the direction and magnitude of this relationship. In parallel, there also seems to be a number of reasons why potential effects could differ widely, depending on whether the focus is on developing countries or developed ones (i.e. OECD countries). Section 2.1.2 presents detailed discussion of empirical research examining this particular path.

Apart from direct effect on economic growth, the research has also emphasised a number of other channels through which a reduction in the gender gap in education could positively affect macroeconomic performance (see section 2.1.3 for more details).

One of the most common propositions is that higher educational attainment among women has a strong negative effect on fertility (Barro and Lee, 1994). Women with higher education tend to benefit from a higher employment rate and higher average income, which may in turn incentivise women to postpone the decision to start a family and/or have more children, because of a higher opportunity cost

related to the choice of leisure instead of labour. However, while a negative relationship between fertility rate and income per capita is supported by cross-country empirical data ([17]), there may be very important caveats to bear in mind, depending on the wealth of the country. The impact of education on fertility is likely to be much more ambiguous in developed compared to developing countries. One explanation may be that increments in income as a result of additional education may be valued more strongly for people with lower incomes, which means that additional education may have a stronger impact on the decision to postpone reproduction in low-income countries.

Another potential channel which is fairly broadly discussed in the literature is the positive relationship between women's education and employment rate. It is often argued that better educated women are more likely to be employed and, moreover, the earnings gap is also less pronounced among well-educated women and men than among those at the lower educational echelon (Gornick, 2012).

Furthermore, there is considerable literature which focuses particularly on developing countries and which indicates various type of social gains induced by the increasing educational performance of women, including improvements in family and child health, increasing life expectancy or improvements in the educational attainment of children (e.g. Schultz, 1988; Behrman and Deolalikar, 1988; Bellew, Raney and Subbarao, 1992; Subbarao and Raney, 1995).

Other potential channels highlighted in the literature include increased financial literacy and consequently a higher propensity for saving and better pension planning (Lusardi, 2008), as well as a reduction in gender segregation in traditionally men-dominated sectors and occupations.

2.1.2. Effects of the gender gap in education on economic growth

In a very influential paper, Barro and Lee (1994) used a panel data set of 138 countries to examine the empirical determinants of growth, including measures for both female and male schooling. In what they see as a 'puzzling finding', the education of girls and women was negatively correlated with growth. Barro and Lee attribute this to a sign of

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([17]) See for instance Gapminder, *Total fertility and income per capita*, 2016, available at: http://www.gapminder.org/world/#$-majorMode=chart$is;shi=t;ly=2003;lb=f;il=t;fs=11;al=30;stl=t;st=t;nsl=t;se=t$wst;tts=C$ts;sp=5.59290322580644;ti=2015$zpv;v=0$inc_x;mmid=XCOORDS;iid=phAwcNAVuyj1jiMAkmq1iMg;by=ind$inc_y;mmid=YCOORDS;iid=phAwcNAVuyj0TAlJeCEzcGQ;by=ind$inc_s;uniValue=8.21;iid=phAwcNAVuyj0XOoBL_n5tAQ;by=ind$inc_c;uniValue=255;gid=CATID0;by=grp$map_x;scale=log;dataMin=194;dataMax=96846$map_y;scale=lin;dataMin=0.84;dataMax=9.2$map_s;sma=49;smi=2.65$cd;bd=0$inds=

'backwardness'in society, where gender differences may be confounded with other issues of less developed countries that may not have been captured with an initial GDP variable. Hence, these less developed countries may experience higher growth rates due to a convergence mechanism. Yet, this finding was challenged by some of the subsequent research, usually on the basis of econometric problems in the empirical estimation, including multicollinearity (Knowles et al., 2002) and a lack of accounting for anomalies reflected in the influence of a few outliers, such as four Asian countries (Hong Kong, Singapore, Taiwan and South Korea) where very high levels of growth were accompanied by very low levels of female schooling (Stokey, 1994).

Lorgelly and Owen (1999) were motivated by these very methodological concerns about Barro and Lee's (1994) conclusions. The authors tested the sensitivity of Barro and Lee's (1994) results by deleting selected countries from the sample as well as by omitting female education from the growth equations. They concluded that both the negative coefficient for women and the positive one for men identi-fied in Barro and Lee's paper are of a fragile nature.

A study by Baliamoune (2008) used panel data for 41 coun-tries — 31 sub-Saharan African and 10 Arab countries (time series: 1974-2001) — and attempted to empirically assess the impact of the various literacy ratios of women and men aged 15-24 on economic growth in the analysed countries. In the initial version of the model, all but one variable (investment) including the gender gap in educa-tion expressed as a literacy ratio did not have a significant effect on economic growth. However, when the authors used alternative specifications of the regression equations (including replacement of fertility with women's share of the labour force), they found that the gender gap in edu-cation has a negative effect on income growth, while the measure of educational human capital has a positive im-pact. The study found that the gender gap in education has a stronger negative effect on growth in Arab countries. In addition, the authors found out that the interaction be-tween openness to trade and the gender gap in education has a positive impact. Indeed, such a result may suggest that trade-induced growth may parallel greater gender in-equalities (a large share of uneducated women being em-ployed in export sectors) (Baliamoune, 2008). However, it should be noted that the women-to-men literacy ratio may be close to one in most EU countries and therefore may be far less suitable as an explanatory variable than in the Arab or African countries.

Furthermore, Brummet's (2008) research focusing on 72 countries (panel data for the 1960-1985 period) found that the inefficiencies created by gender gaps in education are sizeable enough to decrease productivity to a level that will

harm growth rates. The study found the gender gap in ed-ucation to have a significant negative impact on growth. Among three measures of the gender gap in education constructed by the author, primary education displays the most significant correlation with growth. The average years of schooling differential is also significant, although much weaker. As Kabeer and Natali (2013) interestingly point out, '[o]ne possible implication is that countries with higher in-comes will tend to make goods that require larger amounts of human capital to produce. This would make secondary education relatively more important than in less developed nations.'

A study by Klasen (2009) aimed at capturing both the direct impact of education on economic growth and indirect impacts such as effects on investment rates, overall population growth, and growth in the working-age population. In the key equation measuring the impact on growth, the initial female–male ratio of participation in education was positive as expected, but not significantly so. In contrast, the female-male ratio of growth in adult years of schooling turned out to be significant. The regions with the largest gender gaps in education — South Asia, sub-Saharan Africa, and the MENA region — were found to incur the largest losses in terms of economic growth. For instance, the total combined effect (direct and indirect) in South Asia, sub-Saharan Africa and the MENA region was estimated, respectively, at 1 %, 0.8 % and 0.7 % of annual loss of per capita growth.

Yet another study which did not yield clear-cut results and where findings were fairly sensitive to recalibration of the model is Knowleds (2002). More specifically, this study, focusing on a sample of 75 countries (panel data for the 1960-1990 period), found the coefficient on girls' and women's education to be positive and statistically signifi-cant while the coefficient on boys' and men's schooling was not significantly different from zero. The assumption was that countries with a higher level of female schooling will have higher levels of labour productivity, other things being equal. Yet, a re-estimation of the model, where the variable of life expectancy (a proxy for health capital) was included, rendered the coefficient on female education in-significant. In addition, the author also acknowledged that coefficients are not always stable when the sample is split into developed and developing countries.

In one of the rare papers which did not use the regres-sion model, Lagerlöf (2003) set up a model where increas-ing gender equality can lead to a reduction in economic growth. Based on the simulation, using a two-period model driven by the interaction of players, Largerlöf concludes with the following findings: 'As spouses' human capital levels become more equal, and women's time becomes

more expensive, couples respond by substituting quantity for quality in children — fertility thus falls, and rates of human capital and per capita income growth rise. At the same time, rising levels of human capital also lower mortality, making population growth rise simultaneously with per capita income growth. Eventually, as mortality levels out, and fertility continues falling, population growth starts to decline, whereas per capita income growth continues to rise, stabilising on a balanced growth path.'

2.1.3. Other types of economic effects of the gender gap in education

Apart from the literature investigating the direct relationship between gender inequality in education and economic growth at the macro level, there is a substantial literature which has examined other types of macroeconomic effects.

A study by Gornick (2012) examined educational differences (or their absence) in women's employment rates, women's and men's hours worked per week, and gender inequality in both annual and hourly earnings. The study found that better educated women are more likely to be employed; gender inequality in annual earnings is thus less extreme among the well educated than among those with a lower level of education, driven largely by educated women's higher employment. More specifically, the study found that in 16 out of the 17 countries analysed ([18]), mothers with post-secondary education exhibit the highest employment level. Women with post-secondary education were also found to be on average about twice as likely to be in employment as women in the lowest education category, and in some countries they were more than six times as likely.

Furthermore, existing evidence suggests that, especially in developing countries, increases in education among girls and women reduce fertility (Barro and Lee, 1994; Brummet, 2008; World Bank, 2011; Klassen, 2009). The fertility rate typically falls sharply when income increases from a very low level to a higher, but still below average, level. The fall in the fertility rate smoothens thereafter but the negative relationship between income and the fertility rate continues to persist. The common explanation is that better educated women tend to be more frequently employed and gain higher wages, which in turn translates into higher opportunity costs of exclusion from the labour market, thereby influencing reproductive decisions ([19]). Apart from

fairly clear-cut evidence from empirical data ([20]), the negative impact on fertility is further strengthened in models that incorporate the costs of having and raising children (Barro and Lee, 1994).

In addition, the literature refers to other types of social benefits, such as reduced infant and child mortality, improvements in family and child health, and increases in life expectancy (Barro and Lee, 1994; Schultz, 1988; Behrman and Deolalikar, 1988; Bellew, Raney and Subbarao, 1992; Subbarao and Raney, 1995). There is also some empirical evidence that adult education among women may have a greater effect on the involvement of children in the household in school-related activities than adult education among men (Filmer, 1999). For instance, Behrman et al. (1999) found that children of more literate mothers in India study nearly two more hours a night ([21]).

Apart from looking at the impact of the gender gap in education on economic growth, Klasen (2009) also analysed the effects on investment and found a positive and significant relationship between education and investment. This finding is also in line with some research undertaken at the micro level. For instance, using the data collected through a survey of women (sample of ~750 women aged 50+), Lusardi (2008) investigated the implications of gaps in financial literacy on saving and retirement planning. She found that there is a strong and positive correlation between financial literacy, on the one hand, and saving and retirement planning on the other (the results were significant, at 1 %).

2.1.4. Methodological approaches in empirical research

A common way of exploring the link between the effects of the gender gap in education (in particular differences in attainment level) and economic growth, at least at the cross-country level, has been regression analysis (cross-section and panel). It is not uncommon that research relies on the standard growth model (subject to various extensions), with the Cobb-Douglass production function and human capital as a key regressor that incorporates various proxies for the gender gap in education (see Box 1.1).

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[18]   Sample included: Austria, Brazil, Canada, Czech Republic, Estonia, Germany, Greece, Guatemala, Ireland, Israel, Luxembourg, Mexico, Netherlands, Spain, UK, United States and Uruguay.

[19]   'Fertility and living standards: Go forth and multiply a lot less', *The Economist*, 2009, available at: http://www.economist.com/node/14743589

[20]   See Gapminder, *Total fertility and income per capita*, 2016, available at: http://www.gapminder.org/world/#$majorMode=chart$is;shi=t;ly=2003;lb=f;il=t;fs=11;al=30;stl=t;st=t;nsl=t;se=t$wst;tts=C$ts;sp=5.59290322580644;ti=2015$zpv;v=0$inc_x;mmid=XCOORDS;iid=phAwcNAVuyj1jiMAkmq1iMg;by=ind$inc_y;mmid=YCOORDS;iid=phAwcNAVuyj0TAIJeCEzcGQ;by=ind$inc_s;uniValue=8.21;iid=phAwcNAVuyj0XOoBL_n5tAQ;by=ind$inc_c;uniValue=255;gid=CATID0;by=grp$map_x;scale=log;dataMin=194;dataMax=96846$map_y;scale=lin;dataMin=0.84;dataMax=9.2$map_s;sma=49;smi=2.65$cd;bd=0$inds=

[21]   See http://digitalcommons.iwu.edu/cgi/viewcontent.cgi?article=1237&context=parkplace

Box1.1 Most common proxies for the gender gap in education

In terms of proxies used to capture the gender gap in education, there have been clear variations stemming from the context of the research and the availability of data. The most common indicators used include:

(i) the differences in youth literacy rates between girls and boys;

(ii) the differences between average years of schooling in the population disaggregated by sex;

(iii) the measures of the differential in primary and secondary school enrolment;

(iv) the ratio of the growth rate in women's/men's education level for a specific period.

In a seminal study on the determinants of economic growth, Barro and Lee (1994) applied multivariate regression where the real per capita growth rate was explained by two main types of variables. One incorporated the stock of human capital in the form of educational attainment and health [22], and the second comprised a set of fairly standard control variables typically used to explain economic growth, such as the ratio of government consumption to GDP, the ratio of domestic investment to GDP, the fertility rate, the black-market premium on foreign exchange, changes in the terms of trade, measures of political instability, the amounts of political freedom and civil liberties, tariff rates, and so on. In terms of educational attainment specifically, it relied on census/survey information on schooling of the adult population (aged 25 and over), by sex and level.

Similarly, Baliamoune (2008) relied on the standard neoclassical growth model with investment rate, human capital and fertility rate as key variables. As a proxy for human capital specifically, youth literacy rates were broken down by sex. One of the reasons for the selection of such a proxy was the use of similar indicators in the Millennium Development Goals (i.e. the women-to-men parity index as a ratio of literacy rates). The model also took into account the crucial role of international trade in terms of its different implications for less educated women in developed versus developing countries.

Knowles and Lorgelly (2002) examined empirical evidence of the different long-run effects of female and male schooling on labour productivity, relying on the Mankiw-Romer-Weil version of the neoclassical growth model (with Cobb-Douglass exhibiting CRS and positive and diminishing marginal products). Apart from capital, labour and total factor productivity, this also included broader measures of human capital, which was composed of three types of variables: stock of health capital; stock of female education; and stock of male education. The stocks of female and male education were derived respectively as fractions of real output invested in female/male education and were assigned coefficients of α and β, which represented the gender gap. Consequently, those coefficients were meant to reflect the output elasticities with respect to female and male education. As a proxy for stocks of educational human capital (stock of female and male education in their model), the average years of schooling of the population aged 15 and over, disaggregated by sex, were used. The stock of health capital was proxied by the average life expectancy.

Klasen and Lamanna (2009) investigated to what extent gender gaps in education and employment reduce economic growth. In terms of educational gender inequality, female and male education levels were not separated in equations. Instead, four different education variables were generated: (i) the variable for initial level of education in 1960; (ii) the gender gap in education in 1960; (iii) the growth in the level of education between 1960 and 2000; and (iv) the growth rate of the female-male education-level ratio for the 1960-2000 period. Gender inequality in the labour market was proxied by gaps in labour force participation. The research relied on cross-country and panel regressions. The key equation measured the direct impact of education and the gender bias in education on economic growth, controlling for investment, population, and working-age population growth. The total effect of the gender gap in education on growth was determined by path analysis, in which the direct effect and indirect effects were summed to gauge the total effect of gender inequalities in education on growth.

In a study on the impact of the gender gap in education on economic growth, Brummet (2008) used a model which assumed economic growth as being a function of gender inequality, and included economic control variables

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[22] Note that average years of schooling are typically used to proxy for stocks of educational human capital (see Barro and Lee, 1994; Klassen, 2000), while school enrolment rates tend to proxy for investment in educational human capital (Knowles et al., 2002).

affecting growth (i.e. investment, government expenditure, exchange rates, etc.) as well as accumulation of human capital (incorporating a log of life expectancy and initial level of education). Three concrete measures of the gender gap in education were used: (i) the differences between average years of schooling in the population; (ii) a measure of the differential in primary school enrolment; and (iii) differentials in secondary school enrolment.

Only a small number of studies relied on techniques other than econometric regressions. For instance, in his study on the investment decisions of parents that affect human capital and ultimately growth rate, Lagerlöf (2003) ran a simulation exercise based on game theory. The author used a standard two-period model with a standard preference assumption used to model parents' behaviour (i.e. parents maximise utility from 'their investment' in a child).

2.2.   The economic benefits of gender equality in labour market participation

2.2.1.   Background

While there are some studies considering the impact of gender inequality on labour market outcomes, they are limited in number due to a lack of internationally comparable data and the difficulties in addressing endogeneity and reverse causality (Kabeer and Natali, 2013). This is particularly true with respect to the wage gap, which is investigated in section 2.3. Nevertheless, this section summarises the empirical research on the impact of gender equality in labour market participation on economic growth and other macroeconomic outcomes, which is plausibly positive, even though often difficult to fully evidence.

Given the assumption that it is possible to increase employment without reducing productivity by the same extent ([23]), it is easy to imagine the positive effect of gender balance in terms of employment. Increasing women's employment will have the same (positive) effect as increasing the employment of the whole labour force, translating into higher GDP and counterbalancing the negative effect of an ageing population in developed countries. This proposition has been summarised by Matsui et al. (1999), who first used the word **womenomics** to illustrate the theory that women today play a primary role in economic growth.

From the perspective of long-term economic growth, there are only two ways that an economy can raise its potential growth rate: capital and labour … It is widely acknowledged that Japan has already massively overinvested in capital … There are only three possible solutions … (1) seek ways to raise the birth rate, (2) allow more immigrants into Japan, or (3) boost female workforce participation.

Matsui et al. (1999) argued that the third option 'is the most practical and realistic solution'. OCED (2012a) research shows that the projected number of people in the labour force for the 2011-2030 period is forecasted to remain flat or decrease in most European countries (with the exception of Ireland, Luxembourg and Norway), if labour force participation rates for women and men aged 15-64 remain constant ([24]). On the contrary, converging participation rates for women and men would largely counterbalance this trend.

On average, women's employment rate in the EU is 63.5 %, while the rate for men is 75.0 % (data for 20-64 age group as of 2014 ([25])), which gives a gender employment gap of 9.5 p.p. The differences at the individual country level are sometimes larger.

Following on from the previous argument, many studies in this strand of the literature simply estimate the effect of gender equality on the labour market by simulating the effect of increasing employment (up to a certain threshold) on GDP. However, these studies usually do not address a number of potential issues, such as the effect on the current workforce and productivity (occasionally a productivity drag is applied), and assume a completely elastic demand (for the limitations of this type of approach, see the introduction to this study). Thus, this section separates the papers and reports that simply calculate the impact of gender equality through simulations and those that estimate macroeconomic regressions, using gender equality in the labour market as one of the independent variables.

It is worth adding a note of caution before continuing: while some studies refer to participation, others refer to employment. The two are highly correlated and labour force participation could be used as a proxy for employment rate. Nevertheless, it may be that a growth in participation would not cause the same growth in the female employment rate, if unemployment among women also increases. On the other hand, employment rates are available and comparable

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([23])   With diminishing return to labour, more people working would reduce total productivity. Studies usually consider that a 1 % increase in employment would translate into a 0.6-0.7 increase in GDP, thus the increase in employment does not cancel out completely because of the reduction in productivity.

([24])   Number of persons in the labour force in 2011 (2030 in parentheses), thousands, selected European countries: Czech Republic 5 100 (4 600), Denmark 2 900 (2 800), Germany 42 000 (47 000), Ireland 2 100 (2 300), Greece 5 100 (4 900), Spain 22 500 (21 500), France 29 000 (29 000), Italy 24 000 (22 000), Hungary 4 300 (3 800), Netherlands 8 900 (8 100), Poland 18 000 (15 000), Portugal 5 300 (5 100), UK 32 000 (32 000).

([25])   Eurostat (2015).

across the EU thanks to Eurostat data. Data are more prone to issues of measurement error and international comparability for developing countries (Klasen and Lamanna, 2009). Consequently, some studies including an international comparison often use labour force participation.

2.2.2. Direct effects identified through basic assessments

In a paper published by Goldman Sachs, Daly (2007) simulated the effect of the elimination of the gender employment gap on the level of GDP. More specifically, Daly found out that aggregate output would rise by 21 % in Italy, 19 % in Spain, 16 % in Japan, 13 % in the euro area, 9 % in Germany, France and the United States (US), 8 % in the UK, 5 % in Denmark and 3 % in Sweden. The author also points out that those estimates assume unchanged productivity and hours worked. However, even with diminishing marginal productivity of labour, the effects remain large.

Löfström (2009) focuses exclusively on the EU. She first shows that there is a linear and positive correlation between GDP level and gender equality. She then estimates the effect of full gender balance on the labour market, which she assumes is characterised by: (i) a female activity rate equal to the male activity rate; (ii) women's part-time work decreasing to the level of men's; and (iii) women's productivity becoming equal to that of men. She suggests interpreting her estimates as an upper boundary of potential effect. Simulation shows a potential GDP increase from 14 % (Slovenia) up to more than 40 % (Greece, Malta, the Netherlands), with the EU average of about 27-29 % (unweighted and weighted respectively), i.e. a gain of EUR 6 800 per capita. At the European level, the higher female activity rate accounts for 41 % of the total increase in GDP, while reduction in part-time employment accounts for 28 %, and equal productivity for 31 %. In addition, the author also highlights the 'multiplier' effect of increasing employment for some types of jobs, for instance in the elderly and childcare sectors: these sectors directly create jobs that often target women, and these jobs also free women from unpaid care responsibilities, enabling them to increase their labour supply.

In the more recent projection proposed by Aguirre et al. (2012), estimates are slightly lower than in Löfström's research. Authors show that increasing women's employment rates would have a gross positive impact on GDP for selected European countries. It would vary between 3 % (Sweden) and 19 % (Italy). Once the productivity drag and a plausible proportion of women working part-time are taken into account, the net impact on GDP would vary from 2 % (Sweden) to 11 % (Italy).

The OECD (2012b) estimates that if women's labour force participation were to reach the level of men's by 2030, the Italian labour force would increase by 7 % and GDP per capita would rise by 1 percentage point per year, while the French labour force would increase by 5.2 % with a respective GDP per capita rise of 0.4 percentage points (and a total increase in GDP of 9.4 % by 2013). Similarly, annual growth rates in GDP per capita would rise by 0.5 percentage points in the UK and by 0.6 in Belgium.

Some studies focus on only one country. Casarico and Profeta's (2007) research focusing on Italy suggests that if 100 000 more women worked (+ 1 % in the female employment rate), GDP would increase by 0.28 % [26]. Zisza (2008) presents three possible scenarios: (i) bringing the female employment rate to 60 % would increase Italian GDP by 6.5-9.2 % (the lowest number includes the productivity drag); (ii) increasing the female employment rate so it was equal to that of men (for each macro region) would increase GDP by 12.3-17.5 %; and (iii) bringing the female employment rate in southern Italy into line with that of central and northern Italy would increase GDP by 4.0-5.8 %. Both studies also point to the virtuous circle that would be activated: first, increasing GDP would create resources to be spent on facilitating women working (e.g. public childcare, parental leave); second, increasing the average wage of women would increase the opportunity cost of staying at home, fostering women's participation even more.

Looking outside Europe, Matsui et al. (1999) aimed at identifying the factors behind the strength of the female economy. Among other aspects, they suggested that increasing women's participation rate in Japan from 50 % to US levels of 59 % could boost real GDP growth by 0.3 percentage points per year during the 2000-2010 period. They also note that women are boosting consumption in some specific sectors and that increasing women's income may thus have an additional positive effect on those sectors. The authors have published updated reports every 5 years (Matsui et al., 2005, 2010, 2014), in which they have reported similar estimates. Even though the female participation rate has increased in the meantime (in 2009 it was 60 %, the target the authors fixed in 1999), they have not investigated if it had the expected effect on GDP growth.

Bryant et al. (2004) consider the effect of labour force participation on GDP in New Zealand. They simulate the effects under the specific scenario where women aged 25-34 increase labour force participation (the 'young women' scenario), and the scenario concerning the whole population aged 15 or over ('overall' scenario). The participation rates are set equal to the average of the top five OECD countries for the same group of people. Under these hypotheses, in the 'young women'

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[26] To reach the employment rate of men, 900 000 more women would need to work.

scenario GDP would be 1.0 % higher (USD 1 215 million), and 5.1 % higher in the 'overall' scenario (USD 6 101 million). They also present alternative specifications, most of them leading to larger effect on GDP in both scenarios.

In a different simulation proposed by Tzannatos (1999) ([27]), the author looks at potential welfare loss due to gender segregation in specific occupations, focusing on Latin American countries. He shows that women's wages can significantly increase (from + 25 % up to + 96 %, depending on the country), with only a modest reduction in men's wages (from - 6 % to - 13 %), leading to large GDP gains from such a change (with GDP rising from + 2 % to + 9 %). However, the percentage of the labour force to reallocate is large (from 12 % to 37 %), a process which may take a long time. Tzannatos (1999) also underlines some of the limitations of this approach: female segregation can occur not only in terms of occupations, but also in terms of women being predominantly employed in part-time work with high turnover rates, short job tenures, unsocial hours and low trade union membership. However, these features of segregation are not evident in the measures of segregation used in this approach.

Finally, a recent report (ITUC, 2016) discusses the number of new jobs that could be generated by increased invest-ment in the caring industry in seven OECD countries. The authors find that if 2 % of GDP was invested in the care in-dustry, increases in overall employment ranging from 2.4 % to 6.1 % would be generated, depending on the country. This would mean that nearly 13 million new jobs would be created in the US, 3.5 million in Japan, nearly 2 million in Germany, 1.5 million in the UK, 1 million in Italy, 600 000 in Australia and nearly 120 000 in Denmark. As a conse-quence, the employment rate of women would increase by 3.3 to 8.2 percentage points (and by 1.4 to 4.0 percentage points for men). The gender gap in employment would also be reduced (by between half in the US and 10 % in Japan and Italy), the precise figures depending on specific coun-try characteristics. However, the overall effect on the econ-omy is not analysed in this study, which simply discusses the additional jobs that would need to be created in order to meet increased demand for caring services generated by increased public investment.

2.2.3. Direct effects identified through theoretical models and macroeconomic regressions

Klasen (1999) assesses the impact of gender inequality in education and employment on the long-run economic growth rate, building on a theoretical model of economic growth proposed by Barro (1991) and Barro and Sala-i-Martin

(1995). Using data from international sources ([28]) for the 1960-1992 period, he estimates several single-equation macroeconomic regressions to isolate effects of gender equality on growth. The author controls for variables which may affect growth. This first paper is mainly focused on education inequality but in one specification it also includes two possible measures of gender inequality in employment. The growth in women's share of the working-age population employed in the formal sector has a large and significant impact on economic growth (an 8 % increase in the annual rate of GDP growth, statistically significant at 5 % level), while the effect of the growth in women's share of the labour force is not significant. The author suggests that the link is twofold: (i) distortion (the average ability of workers is lower in the presence of gender inequality); and (ii) the measurement effect (work performed by women is made visible), with an additional increase in productivity. However, the author is not able to exclude reverse causality (economic growth may foster women's employment), and these results should be read with caution.

Klasen and Lamanna (2009) address these issues in a paper applying a panel regression ([29]) to data for the 1960-2000 period, using fixed effects. Reducing gender inequality in employment may increase the annual rate of GDP growth from 2.97 % to 7.86 %, depending on the specification, the sample of countries, and the control variables used.

In addition, their results suggest that it is not easy to sep-arate the education gap and the employment gap and to test which one is more important, since results depend on the sample, selected time period and variables used. While the paper has a good strategy to address potential caveats, authors are cautious in completely excluding omitted vari-able bias and endogeneity. One additional drawback the authors suggest is the difficulty of separating gender gaps in education, employment and pay — both at theoretical and empirical levels.

More recently, Mitra et al. (2015) attempted to address and solve all these problems by investigating the impact of gender equality on growth using a sample of 101 countries for the 1990-2000 period and replicating the same growth model, controlling for a set of standard independent variables. To include several aspects of gender equality in a single model, without incurring multicollinearity, the authors use exploratory factor analysis (EFA) on five measures of gender equality, which results in two non-collinear factors: **equality in opportunity** (inverse fertility rate, secondary enrolment gap, partial literacy rate gap); and

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([27])   This study is further discussed in the 'pay gap' section 2.3.

([28])   Penn World Tables, Wistat (Unicef), World Bank.

([29])   Treating each decade as one observation and using initial values of the covariates.

equality in outcomes (percentage of women in parliament and gender gap in labour force participation). To address endogeneity and unobserved heterogeneity, they employ the 'difference GMM' estimator, which instruments current period differences with the lagged values (Arellano and Bond, 1991). Finally, to solve serial correlation, the authors use non-overlapping 5 year averages of the variables and include some lagged variables. They find that a standard deviation improvement in the equality of opportunity increases growth by 1.30 percentage points (significant at 5 %), and a standard deviation improvement of equality of outcomes improves growth by 1.19 percentage points (significant at 5 %). In addition, using interaction, they show that OECD countries benefit more from equality in outcomes. Their results are robust to different sensitivity checks.

Esteve-Volart (2009) adopts a somewhat different approach. She develops a theoretical model to assess the implication of gender discrimination in the labour market, defined as exclusion of women from managerial positions and their complete exclusion from the labour market. In the theoretical model, she shows that discrimination reduces female investment in human capital and economic growth, and GDP per capita. These results prove again that the gender gap in the labour market and in education are highly correlated, in both directions. The model is tested using data from the Indian states over the 1961-1991 period, with a regression where the dependent variable is per capita state domestic product and which includes socio-economic controls. Possible endogeneity is addressed with instrumental variables (IV). Both the ratio of women-to-men managers and women-to-men workers are positively related to output: an increase in the ratio of women-to-men managers in one unit (from 100 % men to 50-50) would lead to a 319 % increase in per capita income (582 % with IV); an increase in the ratio of women-to-men workers in one unit (e.g. from women making up half of the employees to there being twice as many women employed as men) is associated with a 153 % increase in per capita income (464 % with IV) [30]. In addition, the author confirms the effect on education. The results are robust to different specifications, and the author discusses and excludes the notion that they are simply an accounting effect.

Cuberes and Teignier (2012, 2016) propose a similar theoretical framework which illustrates the negative impact of gender gaps on resource allocation and aggregate labour productivity. Gender inequality is introduced as an exogenous limitation to women's access to entrepreneurship [31] and participation in the labour force. The theoretical predictions are confirmed by simulation.

■ Gender inequality in entrepreneurship lowers aggregate productivity and equilibrium wages, since the average talent of entrepreneurs' decreases; in fact, when all women are excluded, the loss in output per worker is about 10 %.

■ Gender inequality in labour participation reduces income per capita: when all women are excluded, the income per capita loss is about 40 %.

The cross-country analysis (a simulation performed on OECD and non-OECD countries separately, with data from the International Labour Organisation (ILO)) shows that gender gaps cause an average income loss of 15 % in OECD countries, out of which 40 % is due to the entrepreneurship gap. The authors also recognise some limitations in the model due to the assumption that women and men have the same talent distribution (which may not be the case if women are less or more educated), as well as the assumption that there is only one production sector. In addition, they highlight possible future research by introducing household production and a dynamic version of the model, which would allow for an estimation of the effects on capital accumulation and growth.

A recent paper (Hsieh et al., 2013) measures the macroeconomic consequences of the convergence in occupational distribution between white women and men and black people over the last 50 years in the US. They find that changes in occupational barriers facing black people and women can explain 15 to 20 % of aggregate wage growth between 1960 and 2008. Furthermore, essentially all of the gain is driven by the movement of women into high-skilled occupations.

Loko and Diouf (2009) include women's labour market participation in a paper that investigates the determinants of productivity growth (considered to be the main driver of long-term per capita growth). The data set includes 62 countries over the 1970-2005 period. The authors firstly assess the relationship using principal component analysis and then estimate a productivity growth equation, using a GMM dynamic panel estimator (Blundell and Bond, 1998). The results show that the growth in the share of women in the labour force has a positive and significant effect on productivity growth (3.4 % growth in total factor productivity, significant at 10 %).

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[30] When comparing these estimates with the ones presented previously, readers should bear in mind that they refer to a substantial (and hypothetical) reduction of gender inequality in the labour market.

[31] For a review on patterns and determinants of women's entrepreneurship across countries, see Minniti and Naudè (2010).

Finally, a study by Cipollone et al. (2013) analyses historical trends to assess the role of social policy (i.e. policy related to childcare and elderly care) as well as institutional factors (changes in labour flexibility and security) in labour market participation. The authors find that labour market reforms and changes to social policies predict almost 25 % of the actual increase in the labour force participation for young women, and more than 30 % for highly educated women. However, the effects of labour market reforms on the participation of low-skilled women in the labour force are surprisingly small. The effects of such policies on men are not analysed in this study.

2.2.4. Indirect and long-term effect

A number of authors have also underlined the positive relationship between employment and fertility in the OECD countries since 1985 (e.g. Daly, 2007; Smith and Bettio, 2008). In addition, women's employment and earnings increase their bargaining power within the household, with a positive impact on women's well-being and savings rate as well as higher investments in the health and education of children, which contributes to increases in their human capital and consequently future economic growth (Klasen and Lamanna, 2009; Kabeer and Natali, 2013).

Maier and Carl (2003) provide evidence of the impact of increasing women's employment — due to improved availability of childcare facilities — on additional taxes and social security contributions. They conclude that public investment in childcare, which would enable mothers to return to the labour market, could actually increase public revenues both for the state and the social security insurance fund.

The literature on social capital highlights further positive impacts of increasing women's labour market participation. Being in paid work may in fact increase a person's social capital by increasing the opportunities of making new social connections and networks through the workplace (Putnam, 2000; Norris and Inglehart, 2003). On the other hand, much of the 'social exclusion' literature points to a correlation between unemployment and inactivity and low levels of social connections (Paugam and Russell, 2000). Therefore, it might be expected that the relationship between social capital and work has a reinforcing effect, whereby participating in the labour market may increase social capital, while increased (or at least diversified) social capital might facilitate labour market outcomes (Stone et al., 2003).

Furthermore, the increased number of hours mothers spend at work may affect the allocation of time devoted to childcare activities within couples (Hallberg and Klevmarken, 2003). Sayer et al. (2004) and Mancini and Pasqua (2012), for instance, found that fathers compensate for the reduced amount of time working mothers spend with their children by increasing the amount of time they devote to their children [32].

Finally, increasing gender equality, for example through a more balanced parental leave system, has been found to reduce violence against children as well as intimate partner violence and sexual harassment (Holter, 2005, 2013).

2.3. The economic benefits of reducing the gender earnings gap

2.3.1. Background

One of the most widely cited statistics to highlight the gender wage gap asserts that for every dollar earned by men, only 77 cents were earned by women in 2010 [33]. Similarly, in the EU in 2014, gross hourly earnings by women were on average 16.1 % below those of men in the EU (EU-28). The variation across Member States is 25.4 percentage points, ranging from 2.9 % in Slovenia to 28.3 % in Estonia [34]. The crude statistics do not control, however, for variables that allow for differences in characteristics (such as in education, age distribution, type of job, experience). After controlling for women's and men's different characteristics, the pay gap shrinks but still persists. For instance, Hinz and Gartner (2005) find that in Germany women earn 15 % less than men when comparing women and men in the same job, occupation and firm. Adding further controls, the earnings gap decreases but still persists. The earnings gap is lowest among academics and upper management, but is still equal to 7 %. These figures clearly highlight that the gender pay gap is the result of different inequalities that affect women over the life course. These are as follows: (i) gender segregation in education and in the labour market: women tend to be overrepresented in degrees, training programmes and occupations that offer lower wages than occupations predominantly carried out by men, even when the same level of education and experience is needed, a phenomenon known as 'the undervaluation of women's work'; (ii) occupational segregation both horizontally (across occupations) or vertically (within the hierarchy of occupations); (iii) the career break job penalty and motherhood wage penalty due to maternity leaves; and (iv) the uneven division of unpaid domestic and care work which affect the ability of women and men to devote time to careers and labour market work.

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[32]   On this point, see section 2.4 on unpaid care work.

[33]   US National Committee of Pay Equity, available at: http://www.pay-equity.org/info-time.html. Earnings are considered for a person working year-round and full-time.

[34]   See http://ec.europa.eu/eurostat/statistics-explained/index.php/Gender_pay_gap_statistics

However, even when taking into account such inequalities, a gender pay gap can still be observed. This is what is generally called the **unexplained part** of the gender pay gap (Oaxaca, 1973). Many unobserved factors contribute to generating this unexplained gap. They are gender differences in individual attitudes (Babcock et al., 2003), or employers' preferences and behaviours that affect the wages of women and men. For example, in a recent work by Oaxaca (2015), it has been shown that the pay gap can be affected by different gendered preferences about the features of a job. Women may be willing to give up additional salaries for increased time flexibility and lower job-related stress. In other words, there could be a trade-off between flexibility and pay. Other evidence (Babcock et al., 2003) shows that part of the pay gap can be associated with the absence of bargaining. The absence of training in bargaining can, as a consequence, result in a lower salary than the potentially achievable one.

Differences in the negotiation attitudes of women and men, which can be partly imputed to gendered differences in reservation wages, could be an important ingredient in explaining the pay gap. All other things being equal, men graduates are more inclined to ask for more money and employers might be willing to reward this boldness with higher wages. The research run by Babcock et al. (2003) on Master of Business Administration students in the US highlights that more women than men accepted an initial salary offer, with only 7 % of women against 57 % of men attempting to negotiate the initial offer. A recent book by Gneezy and List (2014) uses an experiment to show that attitudes towards competition are driven by nurture, and, in turn, influence preferences. Women compete as much as men do if they belong to matrilineal societies [35]. On the other hand, identifying what causes the **explained** part of the gender pay gap does not mean that the issue disappears. The existence of direct and indirect discrimination or structural inequalities — including the undervaluing of women's work — is far from being eradicated.

In the long run, persistent differences in the women distribution across many occupations and types of job are not justified per se. If better paid occupations are dominated by men, the pay gap within the same occupation and task could shrink to zero, but it would not imply that there is no inequality in the labour market. In fact, this would just highlight that well-paid jobs are offered to women less often.

An additional factor that has to be considered when studying the impact of the gender pay gap on economic outputs is that wages are the outcome of market forces and demand and supply of labour in a given legal framework. This legal framework often imposes anti-discrimination measures. However, even within the most rigorous legal settings, the pay gap can still persist. Wages, despite being required (in some countries) to be above a minimum level, are not fixed by law. Instead, wages are the result of the interaction of market supply and demand forces.

Turning to the concept of narrowing the pay gap and its consequences, it is clear that a change in the pay gap is to some extent the **result** of market forces of demand and supply, which are both potentially affected by gender biases and, in some cases, discriminations. Analysing how the pay gap can induce GDP growth is sometimes similar to analysing how labour supply and demand can change over time and give rise to a wage more equally distributed across gender. Demand and supply in the labour market generates the observed pay outcome, which differs by gender, as the statistics show.

Both demand and supply reflect potential gender discrimination, which could be responsible for the pay gap [36]. Labour demand is determined by employers — who are often men — and who could have biased perceptions of women's productivity. This, in turn, could generate a demand for women's labour that does not adequately reflect their productivity. This bias in productivity would thus generate a lower salary than the efficient one (if real productivity was taken into account). If these biases attenuate over time, women's salaries would become closer to the level of efficient salaries by shrinking the gap.

The supply of qualified labour is often made up predominantly of men. If women start entering more highly rewarded occupations, the salary gap could shrink. As stated at the beginning of this section, part of the earning gap stems from the fact that women tend to work in less remunerated occupations. By entering more competitive fields, the effect on the pay would be positive. However, the pay gap is likely to be persistent, albeit diminishing, as long as the underestimation of women's productivity persists.

2.3.2. Pay gap and economic outcomes: direct effects

As far as the **direct** effect of the pay gap on economic outcomes is concerned, some research indicates a negative effect of the reduced pay gap on economic growth, at least in the short run. This evidence is, however, scarce

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[35]   The experiment compares the Khasi, a matrilineal society, with the Masai. The Masai women showed little interest in competing, while the Masai men did, with a percentage similar to the US one. Conversely, Khasi women behaved just like Masai men in this respect.

[36]   We refer here only to the subtle discrimination that both supply and demand contains: employers undervalue the productivity associated with women (leading to a lower salary as a result), and women undervalue their productivity (absence of bargaining). We do not consider 'illegal' pay discrimination in this context.

and limited to the work of Seguino (2000). The author uses a neoclassical production function framework to estimate two sets of macroeconomic regressions for the 1975-1995 period, covering 20 semi-industrialised countries. The author includes gender wage differentials computed from aggregate earnings data from the ILO as an explanatory variable that is assumed to promote technological advancement and thereby growth. The author found that export-oriented semi-industrialised countries often rely on a large share of exports generated by women-dominated manufacturing industries. These countries are often characterised by a higher level of gender wage inequality and higher levels of economic growth. This relationship holds even when the gender wage gap measure is adjusted for educational differentials. Seguino's argument is that the pay gap makes women more attractive for employers given their lower wages, and that this can act as an important incentive to employ women. Under this hypothesis, the gender wage gap can be a stimulus to growth in export-oriented economies [37]. Taking men's wage as a benchmark, wider gender wage differentials may be a signal of the profitability of investment. This is because gender wage differentials may signal weaker bargaining power on the part of women workers, leading to low unit labour costs and an assumption on the part of employers of the reduced cost of extracting labour effort from women workers, and limited resistance to poor working conditions. The gender wage gap is a stimulus to investment but also has an influence on economic growth beyond the effect on investment, suggesting that this variable affects the productivity of investment. The author speculates that the more patriarchal the society, the more gender wage inequality is likely to produce more positive effects on growth. This is likely to occur because patriarchies produce institutions that reinforce the internalisation of social norms which favour men, reducing political resistance and therefore the costliness of gender inequality. Schober and Winter-Ebmer (2009), on the other hand, using data from a meta-analysis of existing studies of Blinder-Oaxaca wage decompositions, do not find any evidence that more gender wage discrimination may stimulate economic growth. On the contrary, more discrimination tends to reduce growth rates. Controlling for the different productivity levels of women and men, the authors find that a higher wage gap had a marginal negative effect on growth. None of their results — including those with more extended growth models — show positive and significant relations between a higher gender pay gap and economic growth [38].

The model presented by Blecker and Seguino (2002) shows that when nominal wages are rigid and the exchange rate is fixed, an exogenous rise in the women's wage rate need not reduce (and may even increase) employment of women or men workers, under certain stringent conditions. When nominal wages are flexible and the exchange rate follows a crawling peg, a variety of short-run dynamic outcomes are possible. In the saddle-point case, it is possible to have an export-led boom in which the gender gap is reduced while the real exchange rate depreciates or, alternatively, stagnant exports and a rising gender gap with a chronically overvalued exchange rate.

Research performed by Tzannatos (1999) is also noteworthy. In this work, a simulation in which employers are forced to pay the same wage (implicitly assuming no equilibrium in the labour market) suggests that eliminating wage discrimination would lead to a one-time gain equivalent to approximately 6 % of GDP. To achieve gender wage equality, however, approximately 30 % of the labour force would have to change occupation.

2.3.3. Pay gap and economic outcomes: indirect effects

The research suggests that women tend to save more (Seguino and Floro, 2003; Rossi and Sierminska, 2015). This evidence could imply that reducing the pay gap generates more bargaining power for women, thus leading to a higher saving rate. Seguino and Floro (2003) investigated the effect of reducing the gender wage gap on aggregate savings. They estimated a panel macroeconomic regression on 20 semi-industrialised countries [39] and found that the women-to-men earnings ratio as well as women's share of employment in manufacturing had a significant positive impact on domestic savings rates. The authors found that an increase of one percentage point in women's share of the wage bill raised the aggregate savings rate by 0.25 % of GDP. As women's share of the wage bill was in the region of 15-40 % for most countries in the study, achievement of parity could have a correspondingly large effect on the aggregate savings rate.

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[37] Braunstein and Brenner (2007) analyse the relationship between foreign direct investment (FDI) and gendered wages in urban China. The author finds that because women and men are segregated into different types of industries — with women more likely to be employed in low-skilled, export-oriented production and men in higher productivity and domestically targeted industries — the changing composition of FDI is associated with increasing inequality in female-to-male wages.

[38] These findings have been challenged by Seguino (2011), who raised concerns about the measure used (the wage gap), the failure to restrict the analysis to the labour-intensive manufacturing sectors where women are overrepresented, and the method used for correcting for productivity differences between women and men.

[39] Brazil, Chile, Colombia, Costa Rica, Cyprus, El Salvador, Greece, Hong Kong, Indonesia, South Korea, Malaysia, Mexico, Paraguay, Philippines, Portugal, Singapore, Sri Lanka, Taiwan, Thailand, Turkey.

Rossi and Sierminska (2014) found similar evidence based on US data for older individuals. Using health and retirement study data, they found that women tend to have more patience and are more inclined to accumulate wealth, particularly financial assets.

Lee et al. (2010) note that a more equal distribution of income, by improving women's wage rates, can lead to higher formal savings. Savings in turn are channelled through the financial sector into companies to foster new investments. In many developing countries, access to international capital markets is limited, making the domestic pool of savings the most important source of funds for new capital investment needed to stimulate growth. Studies of the ratio of women-to-men earnings as well as of women's share of employment in manufacturing have identified a definite positive effect of increased women's income on household savings rates (Seguino and Floro, 2003). According to Lee et al. (2010), there is also some evidence that women make more productive investments than their male counterparts, but this remains contested.

Results from these studies highlight that when the pay gap is reduced, bargaining power goes in favour of women, who will shift their resources towards additional savings. At aggregate level, savings will increase, leading to higher GDP per capita.

The implied gender disparity in saving propensities may be linked to differences in saving motives based on gender roles, as well as divergent experiences of economic vulnerability. This presupposes that women and men have differing propensities to save due to variations in external factors which affect savings behaviour. These findings highlight the importance of understanding gender differences in planning savings and in the formulation of financial and investment policies.

In developing countries particularly, microfinance schemes usually target women. The rationale relies on the perception that women make more productive investments than men. While the evidence on this point is mixed, as reported by a study conducted by Chatham House (Ward et al., 2010), women do tend to invest more socially, or, at least they claim to have this concern. A survey carried out among US investors shows that more women than men claim to be concerned about the social content of their investments (Centre for Audit Quality (CAQ) Survey) [40].

Evidence on the credit market also highlights the fact that women have more difficulties in accessing credit, often at

a higher price. Yet, this evidence is not justified by repayment behaviour: women are less prone to default than men (Alesina et al., 2012). As a consequence of this evidence, lower credit access for women is thus strongly detrimental to growth, as women's business projects are as likely to succeed as men's ones, but they are less likely to be funded by financial institutions. Recently, Cavalcanti and Tavares (2008) have proposed a growth model where saving, fertility and labour market participation are endogenously determined and in which there is exogenous wage discrimination against women. According to their model, as barriers to women's labour market participation increase, there are two channels through which per capita output decreases. First, output per capita decreases because women work fewer hours in the market, and so output decreases for the same population. Second, output per capita also decreases because wage discrimination discourages women's labour market participation and decreases the couple's total income, leading couples to choose to have more children. Both effects are of similar magnitude. A higher wage gap thus leads to lower output per capita for two reasons: a direct decrease in women's labour market participation and an indirect effect through an increase in fertility. Using US data in their model, the authors found that a 50 % increase in the gender wage gap leads to a decrease in income per capita of a quarter of the original output. Their results also suggest that a large fraction of the actual difference in output per capita between the US and other countries is indeed generated by the presence of gender inequality in wages.

A report by the Trade Union Congress (*Closing the gender pay gap: an update report for the TUC Women's Conference 2008*) shows that women's unequal pay does not just hurt women, but that it is a cost for society as a whole. The report underlines strong links between the gender pay gap and child poverty, skills shortages and a cost to the economy of the under-utilisation of women's skills in excess of GBP 11 billion a year in the UK. The gender pay gap is therefore economically inefficient.

A recent report by the World Bank (2012) highlights the fact that the main channel of the pay gap and economic growth is indirect. Women with additional education will narrow the gap by earning more. The pay gap reduction will increase the bargaining power of women in the household, by shifting expenditure and investments towards more investments in education and in women's health for the next generation. This is likely to have a spillover effect on society as a whole. There is evidence that women may have a stronger preference than men for spending on goods and services that contribute to the human capital of their children, implying that within a household, women might gear spending more towards education, food or healthcare for children (Stotsky, 2006). Furthermore,

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[40] 40 % of surveyed women, versus 29 % of men, are more inclined to invest in a company that is operating in a socially responsible or environmentally friendly fashion. The CAQ Survey started in 2007.

OECD (2008) research shows that women are more likely to be sustainable consumers, because they tend to buy eco-labelled or organic food, have a higher propensity to recycle and place more value on efficient energy than men. They also pay closer attention in their purchases to ethical issues such as child labour and fair trade.

Finally, a reduction in the pay gap increases women's confidence on the labour market and allows them to gain more responsibility at work and progress into leadership positions. Women in leadership positions are likely to act as role models for future generations. Thus, the effect is not confined to the current generation, and instead is likely to spill over to the next generation onwards, with a virtuous effect (Booth, 2003).

2.4. Gender equality, social reproduction and unpaid care work

2.4.1. Background

The first economic analysis of the allocation of time between genders within the household (Becker, 1965, 1981) used the idea of comparative advantage to argue that the traditional division of labour within the household is efficient due to women's lower wages in the labour market and their biological advantage in childcare. Specialisation of one member of the couple in paid work and the other member in unpaid work was the optimal solution. Following this theory, there is an economic case for an unequal distribution of unpaid work between the genders because moving away from the traditional division of labour would imply a loss in efficiency and ultimately a loss in GDP.

However, over the last decades, economists have moved from the 'unitary' model of Becker (1965) to the now prevalent view that decisions are taken within a 'non-unitary' framework, developed in particular by Chiappori's collective models (1988 and 1997, and extended by Apps and Rees, 1996, Donni, 2003, 2008). These models consider specialisation as a risky strategy taking into account exit options (divorce) or unexpected events (e.g. premature death). A very rich literature has been developed to show the economic benefits for women to work in the labour market and for men to participate in care activities and unpaid work. The economic benefits of women's participation in the labour market are analysed in section 2.2 above.

The argument about an economic case for an equal distribution of unpaid work can be applied to both a society with a very good provision of social infrastructure, i.e. childcare and care services for dependents, and a society with a very low level of such infrastructure. However, the availability, affordability and quality of social infrastructure do play an important role in the interaction between paid and unpaid work and in fertility behaviours.

It is worth noting in this context that the economic models of fertility behaviour developed in the 1970s predict that an increase in women's schooling levels and wage rates leads to an increase in their labour supply and to a reduction in fertility. However, more recent evidence shows that as early as the mid 1980s, the sign of the cross-country correlation between women's labour market participation and fertility changed from negative to positive and became more volatile (Del Boca et al., 2005). Boosting women's employment, if supported by adequate family-friendly policies, will not necessarily lead to significant declines in fertility, as was experienced in the past (Bjorklund, 2007).

Datta-Gupta et al. (2008) examine the effects of family reconciliation policies in the Nordic countries and find that they have a positive impact on fertility by alleviating the pressure between market and domestic work faced by women. Pylkkanen and Smith (2003) provide some evidence that family policies can promote the labour supply of women and more equal role-sharing between mothers and fathers. They found in fact that fathers' parental leave take-up plays an important role in the timing of women's employment after childbirth in Sweden. Mills et al. (2008) show that working women facing an unequal division of non-paid work within the household, and living in institutional contexts with weak support for combining work and parenthood, are likely to limit their fertility intentions. Mortvik and Spant (2005) find a positive correlation between attitudes supporting gender equality in the work environment and fertility, stressing that 'attitudes that keep men at work and women at home make it difficult for both to combine family life with other priorities'. Adsera (2004), using data from developed countries (23 OECD members), finds that lower penalties resulting from childbearing labour market breaks (e.g. paid leave, stable work) induce higher fertility rates. Keck and Saraceno (2013) show that the availability of long and well-paid leave does not have a negative impact on the employment of mothers in the medium term, whereas 'too short' parental leave may be disincentivising women's labour market participation. Furthermore, a high coverage rate while a child is under the age of three increases the employment of mothers in the medium run significantly, whereas high childcare costs are connected to lower employment rates. This leads the authors to conclude that the most effective policy to enable mothers to remain in paid work appears to be generous provision of childcare services for children under 3 years of age. Similarly, the work of Pacelli et al. (2013) confirms that policies aimed at helping women to reconcile work and family are not only useful in increasing women's employment without reducing fertility, they may also reduce employment penalties after motherhood.

Although these literature findings cannot be taken as a proof of causality, they give an indication that higher fertility could go hand in hand with enhancing gender equality and that there is a role for reconciliation policies and social infrastructure in facilitating the materialisation of fertility intentions and, consequently, rising fertility rates, and improving gender equality.

2.4.2. Economic benefits of an increase in men's participation in unpaid care work

In this section, we concentrate on the economic benefits of an increase in men's participation in unpaid work. In order to make an economic case for an equal distribution of unpaid work, the monetary evaluation of unpaid work is not sufficient. Given a total amount of unpaid work, its distribution between genders would not change the value of the total economic activities even if one were to include an evaluation of unpaid work.

In order to evaluate the economic benefits of unpaid work we need to broaden the concept of economic well-being and to include other indicators (Smith and Bettio, 2008). Amartya Sen's contribution (Sen, 1985, 1992, 1999, 2009) is very relevant in this context. Sen underlines that the welfare of individuals and societies should not be measured by income, expenditure or consumption but it should be based on capabilities. He distinguishes between functionings and capabilities. Functionings are beings and doings. For instance, to have a job, to be fed, or to have an education are considered functionings. Capabilities are instead notions of freedom (they can be compared to opportunity sets) and they represent all the potential functionings an individual can choose from. His work is at the base of the Human Development Index (UNDP, 2015) and at the base of the report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz et al., 2008) generally referred to as the Stiglitz-Sen-Fitoussi Commission. Another relevant framework is the one developed by Picchio (1992), which includes the process of social reproduction among the structural processes of production, distribution and exchange. This approach explicitly acknowledges the importance of unpaid domestic and care work for the reproduction of societies.

To evaluate the economic benefits of unpaid work, it is necessary to measure welfare and economic well-being, taking into account all its different dimensions (Smith and Bettio, 2008). For instance, the Human Development Index (UNDP, 2015) takes into consideration some indicators of educational levels and health in addition to measures of income/GDP.

2.4.2.1. Distribution of unpaid care work

Kooreman and Kapteyn (1987) pioneered the body of economic literature analysing simultaneously different types of time use within the household. Using time-use data for US couples, they studied husbands' and wives' time allocation, considering market work and seven types of unpaid activities.

Many studies analyse women's time allocation only (see among others Kimmel and Connelly, 2007 and Maasen Van Den Brick and Groot, 1997). However, thanks to the increasing availability of time-use data, the empirical literature has increasingly focused on men, too.

Using Swiss data, Sousa-Poza et al. (2001) analyse time spent by women and men on housework and childcare. Their findings suggest that men respond less than women to changes in socio-economic variables. However, both better educated women and men spend more time on childcare activities. Furthermore, higher women's wages increase time spent by women in childcare and reduce time spent in housework. Hallberg and Klevmarken (2003) use Swedish data to study childcare time in double-earner couples. They find that changes in the mother's working hours do not significantly affect either parent's care-giving time. On the contrary, changes in the husband's working hours are compensated by the mother providing more care-giving time. In addition, they find that the presence of young children affects the mother's market work and childcare more significantly than the father's. Kalenkonski et al. (2005, 2009) analyse how parents allocate their time between market work, primary childcare and secondary childcare in UK. Again, both studies suggest that the presence of children affects both women's and men's childcare activity, but at a very different magnitude, and that only women's paid work is affected by the presence of (very young) children. Kalenkonski et al. (2009) also take into consideration the effect of wages and find that women's time spent on paid work increases with own wage and decreases with the partner wage. The authors also find evidence that men's care-giving time increases with increasing women's wages.

Guryan et al. (2008) analyse several countries and find that better educated parents generally spend more time with their children than less educated parents. A similar result is found for the US by Connelly and Kimmel (2009a), who report that for both parents an increase in their own wage is positively related with time spent in childcare. They also find that an increase in a mother's paid work leads to an increase in the father's care-giving time. Likewise, Connelly and Kimmel (2009b) find evidence that when mothers' wages are higher, fathers increase their care-giving time at weekends. In Spain, Gutierrez-Domenich (2010) finds that the father's care-giving time increases when the mother is employed and, again, that better educated parents spend

more time in childcare. Gimenez-Nadal and Molina (2013) use time use data for UK and Spain and find that a higher educational level for the mother also positively affects the father's care-giving time.

Using Italian data, Bloemen et al. (2010) and Mancini and Pasqua (2012) analyse simultaneously women's and men's time devoted to paid work, home production and childcare. Both studies find that the presence of children mainly affects women's allocation of time. This is a result commonly found in the literature, proving the 'second-earner' nature of women's employment. In addition, the two studies suggest that well-educated women spend more time in childcare and paid work, thereby to some extent increasing the time their male partner spends on childcare. However, for France, Bloemen and Stancanelli (2014) find that an increase in parents' wages decreases domestic work and childcare for both parents. However, higher women's wages are associated with a higher level of unpaid work by their partner. This result, in line with previously cited literature, suggests that women who are better off in terms of actual or potential earnings tend to have a higher bargaining power within the household. This result proves that spouses' time allocation is not determined by a unitary model of household behaviour, but by a bargaining process between family members (Chiappori, 1988, 1997).

Del Boca et al. (2005) show that there is a positive relation between employment and fertility. The analysis of the temporal and cross-country patterns of women's labour market participation shows how several factors affect the compatibility between childrearing and work (labour market characteristics, social services and family wealth). The most significant factors which facilitate reconciliation of child rearing and work are opportunities for part-time arrangements, the availability of childcare and parental leave options.

2.4.2.2. Economic consequences of an increase in men's participation in unpaid care work ([41])

An equal distribution of unpaid work can improve women's health and children's well-being and therefore improves the economic well-being of a country.

The unequal distribution of unpaid work has negative consequences for women's health levels. McDonald et al. (2005), using time-use data from Canada, show that women's greater hours of unpaid work contribute to women experiencing more stress than men, and that work, time

spent on care of the elderly and housework are more stressful than time spent on childcare. Bird and Fremont (1991) analyse time use data for the US. They begin with the puzzle that morbidity levels are higher for women than men, despite women living longer. They conclude that if gender roles were more equal, women would experience better health than men, which would be more consistent with their longer life expectancy.

Fathering has an important role in children's upbringing. Fathers' involvement in childcare is positively associated with children's social, emotional, physical and cognitive development (Tamis-LeMonda and Cabrera, 2002; Allen and Daly, 2007; Lamb, 2010). These papers show that children's well-being increases with fathers' involvement.

Paternal leave is an important tool for increasing fathers' involvement in childcare. Fathers' participation in parental leave strengthens women's labour market position, enabling women to return to work earlier and eroding the rationale underpinning women's discrimination in the labour market. Paternity leave makes the initial parental experience more similar across gender, producing long-lasting consequences on household allocation of time. Despite the evidence in favour of fathers' role in child development, take-up of leave by fathers is very low.

Loss of earnings is an important factor in fathers' decisions to not take parental leave (Zhelyazkova, 2013). Fathers cite workplace attitudes as an obstacle to utilising leave, even when they are entitled to it, out of fear that it could damage their careers (Bygren and Duvander, 2006). Andreassen et al. (2015) utilise data from time use surveys in Spain to show that fathers are willing to increase their time in childcare activities if cultural and workplace barriers are addressed. Several studies have exploited cross-country variation in policies to determine how easing these barriers can improve fathers' leave-taking. Fathers' leave take-up tends to be higher in countries with generous compensation rates (Moss and O'Brien, 2006) and is especially low in countries like the US, where leave is unpaid (Han et al., 2007). Several cross-country comparisons have shown that fathers are more likely to utilise leave in countries that have a 'daddy quota' in place (O'Brien, 2009; Haas and Rostgaard, 2011).

In terms of the long-term effects of paternity leave, studies have found that fathers who take leave are more involved in childcare (Tanaka and Waldfogel, 2007; Nepomnyaschy and Waldfogel, 2007) and that the average time fathers spend in childcare is higher in countries with generous paternity leave policies (Boll et al., 2014). Moreover, paternity leave is correlated with shorter career breaks, longer working hours, fewer penalties in terms of promotions and

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([41])   Note that in this section paternal leave is used when referring to the use of parental leave by fathers. Parental leave is used when both the mother and the father can take the leave.

wages, and improved labour market positions for mothers (Pylkkanen and Smith, 2003; Keck and Saraceno, 2008).

Taken together, these cross-sectional studies suggest that paternity leave is correlated with a less traditional division of labour within the household.

More recently, a few studies have sought to identify causal effects of paternity leave by comparing the behaviour of parents before and after a change in policy that led to a sudden increase in fathers' leave-taking, thus exploiting exogenous variation in leave experience. Patnaik (2016) uses the Quebec Parental Insurance Program, which improved compensation and reserved 5 weeks of leave for fathers. Patnaik finds that fathers' participation jumped by 250 %, and he presents causal evidence that paternity leave reduces long-run gender specialisation. Kotsadam and Finseraas (2012) report that paternity leave leads to more equal sharing of housework. They consider the implementation of the Norwegian daddy quota — 4 weeks of parental leave reserved for the father — as a natural experiment, and examine the long-run causal effects on attitudes towards gender equality, on conflicts and sharing of household labour, and on support for public childcare. For Sweden, Ekberg, Eirksson and Friebel (2013) find strong short-term effects of the daddy month reform on men's parental leave, but no behavioural effects in the household. For Iceland, Arnalds, Eydal and Gislason (2013) show that there is a direct correlation between the length of leave taken by the father and his involvement in care afterwards.

2.5. The economic effects of women's leadership in firms

2.5.1. Background

The literature on the economic effects of women's leadership is rather limited. Nonetheless, it is possible to separate three main areas of research:

- studies analysing the effect of women's leadership on firm performance;

- research investigating the employment effects of women leaders; and

- studies assessing the effect of women's leadership on wages and discrimination.

Such studies mostly adopt a microeconomic perspective: they examine the benefits achieved by firms when they increase women's representation in top positions.

The definition of women's leadership varies across the studies and is defined alternately as the share of women among top managers, the share of women among the board of directors, or the gender of the CEO, president or owner of the firm.

The vast majority of studies focus on a single country to better tackle potential biases in the analysis. However, a small number of studies consider the effect of gender diversity in leadership positions from an EU perspective.

As often happens, the analysis is complicated by the presence of many confounding factors and possible biases due to endogeneity problems. Causality, in fact, can work in both directions: more gender diversity may affect a firm's performance, and better performing firms may hire more women at the top levels. Moreover, as highlighted by Profeta et al. (2014), the presence of women leaders in firms is likely to be non-random. Indeed, it is presumably correlated with a number of observed and unobserved factors, such as the sector of economic activity, the structure of the workforce, the culture of the firm, and its international profile, which, in turn, may influence the firm's performance as well as its wage and employment policies. Not controlling for the relevant observable factors, on the one hand, and not taking into account endogeneity problems due to unobservable factors, on the other hand, can lead to a substantial bias in the estimated effects.

In the absence of 'natural experiments' (see below), endogeneity problems can be tackled with instrumental variable and/or fixed effects estimations. Many studies assessing the economic impact of women leaders resort to these methods to treat endogeneity (see, for instance, Smith et al., 2006; Dezno et al., 2012; Adams and Ferreira, 2009). However, several papers (especially in the management literature) do not adequately deal with endogeneity, performing only simple correlation matrices and/or Ordinary Least Squares (OLS) estimations, thus delivering possibly biased results (as is the case in Rose, 2007 or Ali et al., 2014, for instance).

Notably, some academic studies exploit the enactment of a law in Norway in 2006 introducing 40 % gender quotas in the boardrooms of public limited liability companies as a quasi-natural experiment, making it possible to identify, in a 'cleaner' way, the causal impact of women board members on several outcomes (see Ahern and Dittmar, 2012; Bertrand et al., 2014; Matsa and Miller, 2013). Recently, however, Ferreira (2015) has highlighted a number of aspects that should be taken into account when using the Norwegian law as a natural experiment to identify the effects of women directors. These aspects include the correct identification of the timing of the treatment brought about by the law, and the group of firms not affected by the treatment to be used as a control group.

The following sections report a review of the most relevant academic studies on the impact of women's leadership, including methods used to address methodological problems. Although they are country-specific, to guarantee homogeneity of research questions and approaches it is possible to extrapolate a certain number of general findings from them. In the discussion, they are divided according to the type of economic outcome analysed.

2.5.2. The impact of women's leadership on economic outcomes

According to a report by McKinsey & Co. (2007), EU companies with a higher representation of women in top positions outperform sector averages, with a 10 % higher rate of return on equity. A report by Catalyst (2007) shows that Fortune 500 companies with more women board members are significantly higher performing: they experience 53 % higher returns on equity, 42 % higher returns on sales, and 66 % higher returns on invested capital. Several academic and country-specific studies confirm that increasing women's leadership significantly boosts firm performance, possibly because it brings advantages in terms of social and cultural diversity in the firm (for instance, Smith et al., 2006; Dezno et al., 2012; Carter et al., 2003; Isidro and Sobral, 2013; Ali et al., 2014; Campbell and Minguez-Vera, 2008). However, a small number of papers find a significant drop in firm performance associated with increased women's leadership (for example, Ahern and Dittmar, 2012; Adams and Ferreira, 2009).

Relating to the wages and discrimination outcomes, while some studies suggest that women leaders significantly contribute to reducing the gender wage gap (for example, Cardoso and Winter-Ebmer, 2010), other research does not find evidence that this occurs (for example, Bertrand et al., 2014).

Differently, results relating to the effect of women leaders on employment substantially agree on their beneficial effects. Several studies find that women managers and entrepreneurs are significantly less likely to undertake workforce reductions during periods of crisis compared to their male counterparts (see Matsa and Miller, 2013, 2014).

These effects are explored in more detail in separate sections below.

2.5.2.1. The effects of women's leadership on firm performance

Different research findings suggest that higher levels of gender diversity are positively correlated with a firm's performance.

Using 15 years of panel data on the top management of the US S&P 1500 firms, Dezno et al. (2012) perform both fixed-effect and instrumental variable estimations and find that women top managers significantly improve a firm's financial performance, but only when the firm's strategy is focused on innovation.

Smith et al. (2006), using a panel data set on the 2 500 largest Danish firms for the 1993-2001 period, find that women top managers are positively associated with firm performance, as measured by profits, value added and revenues. They deal with endogeneity issues by inserting firm fixed effects in their estimations and by using an external instrumental variable approach.

Using data on the Fortune 1000 firms in 1997, Carter et al. (2003) show that gender-diverse boards are associated with significantly higher firm value, even after controlling for several potentially confounding factors, such as firm size, industry and several corporate governance measures.

Campbell and Minguez-Vera (2007) concentrate on a sample of Spanish publicly listed companies over the 1995-2000 period and find that firms with a higher percentage of women board members are associated with significantly higher firm financial value, after controlling for size and a range of firm financial indicators.

Isidro and Sobral (2015), focusing on the 500 largest EU firms over the years 2010-2012, find that the proportion of women board members is positively related with firm financial performance, as measured by the rate of return on assets and the rate of return on equity. This result persists after controlling for size, country, several firm-level financial measures and the characteristics of the boards.

Flabbi et al. (2014) use a matched employer-employee panel data set for Italian manufacturing firms with at least 50 employees and find that gender interactions in the firm are important. Labour productivity in firms with a woman CEO significantly increases with an increase in the share of women workers. The authors interpret this finding in terms of the greater capability of women leaders to interpret the productivity signals of women workers. Their results are robust to controlling for firm fixed effects, CEO fixed effects and worker fixed effects.

Amore et al. (2015) further corroborate the importance of gender interactions in the firm. Using data on Italian family-controlled firms over the 2000-2010 period, they show that women directors working in women-owned firms are associated with significant improvements in the firm's operating profitability. To tackle endogeneity problems, they control for firm fixed effects and perform triple-difference

estimations associated with a propensity score matching as well as external instrumental variable estimations.

A positive effect is also found by Ali et al. (2014), who, exploiting data on the 288 largest Australian firms, document that firms with gender-diverse boardrooms are generally associated with increased firm performance, as measured by labour productivity.

A few studies, however, have found the greater presence of women in company boardrooms and top management to have null or negative effects.

Parrotta and Smith (2013), using a matched employer-employee data set on Danish firms with more than 50 employees, find that increases in the degree of women's leadership are associated with significantly lower risk attitudes, as measured by the variability of investments, profits, return to equity and sales. On the contrary, once controlling for firm fixed effects, women leaders are not found to be significantly related to a reduction in the levels of such variables, thus suggesting, in contrast to the findings of Smith et al. (2006), that women managers do not significantly impact on firm performance.

Similarly, Gregory-Smith et al. (2013), using data on UK listed firms over the 1996-2011 period, find no significant effect of women board members on corporate performance once endogeneity problems are eased through the system GMM estimator, thus concluding that 'proposals in favour of greater board diversity may be best structured around the moral value of diversity, rather than with reference to an expectation of improved company performance'. In addition, Rose (2007), using a sample of listed Danish firms during the 1998-2001 period, found no significant effect of women board members on financial performance, as measured by Tobin's Q. However, since this result is based on a simple OLS estimation, it may be interpreted as a simple correlation, with no causality.

Using the quasi-natural experiment provided by the Norwegian quota law, Ahern and Dittmar (2012) show that the increase in women's representation in boards of directors followed by the quota caused a significant drop in Tobin's Q and in operating firm performance over the following years.

For a sample of US firms for the 1996-2003 period, Adams and Ferreira (2009) find that, even after controlling for firm fixed effects, gender-diverse boards are generally associated with lower firm financial performance, but are more committed to monitoring activities.

In conclusion, although some studies find a negative or null effect, most research points to a positive effect, suggesting that increasing the representation of women in the top

echelons of firms may also lead to favourable economic results (i.e. increased firm performance).

2.5.2.2. The effects of women's leadership on employment

Academic papers assessing the impact of women's leadership on employment outcomes are relatively more recent and few in number. As previously stated, these studies agree in suggesting that women leaders positively impact employment.

Exploiting the quasi-natural experiment provided by the Norwegian quota law, Matsa and Miller (2013) find that firms hit by the law were significantly less likely to undertake workforce downsizing than other firms. They also show that this has led to an increase in the relative payroll costs and in employment levels. The interpretation of these findings relates to different preferences between women and men leaders, with women being more generous and empathetic than men.

Matsa and Miller (2014) use a panel data set for privately owned US firms covering the economic recession (2006-2009) and show that firms owned by women were significantly less likely than firms owned by men to downsize their workforce. Moreover, they find that workers employed in firms owned by women operated with greater labour intensity shortly after the economic recession of 2006-2009, and that such firms were less likely to hire temporary workers. The interpretation of this finding is that women-owned firms are more likely to carry out labour-hoarding practices, that is, to not to lay off employees when it would be economically meaningful (for instance, during a recession).

2.5.2.3. The effects of women's leadership on wages and discrimination

The impact of women's leadership on wages and gender discrimination is less studied and the results are contrasting.

Besides assessing the impact of women leaders on firm performance (see above), Flabbi et al. (2014) show that women CEOs have a positive impact on women's wages at the top of the distribution and a negative impact at the bottom, while the reverse is found for men's wages. They interpret this finding in terms of women CEOs being better than men CEOs at interpreting women workers' signals of productivity, thus making their wages more sensitive to individual productivity of labour.

Cardoso and Winter-Ebmer (2010) use a panel data set for Portugal covering the 1987-2000 period to show that, when controlling for firm fixed effects and a large set of

time-variant characteristics, women-owned firms are associated with a reduction in the gender wage gap of 1.5 %, thus indicating that increasing opportunities for women at the top is important for reducing gender inequality.

In contrast, using the Norwegian law, Bertrand et al. (2014) find no evidence that increases in the proportion of women board members have contributed to narrowing the gender wage gap. They also show that the law has not significantly contributed to increasing women's participation in other top positions (i.e. other than that of board member).

Using a matched employer-employee data set on white-collar workers in more than 4 000 Norwegian firms, Kunze and Miller (2014) evaluate whether there are gender spillovers in career advancement. They find positive gender spillovers across ranks (from high rank to low rank), thus suggesting that increasing women's leadership helps the career advancements of women in the lower echelons of the firm.

Gagliarducci and Paserman (2015), using a large matched employer-employee panel data set for Germany, examine several outcomes of women's leadership, ranging from firm performance to wage and employment effects. In particular, they find that women top managers and working proprietors are associated with firms that are less productive and less investing, and which pay lower wages, employ fewer people and are more prone to provide childcare facilities and mentoring for junior women staff. However, they show that all these relations disappear once unobserved time-invariant heterogeneity is controlled for, and conclude that there is a substantial sorting of women leaders in a certain type of firms, i.e. smaller, less productive firms that pay lower wages to their employees and are more gender-sensitive. Women leaders are thus **not** found to have a (negative) causal effect on employment and wages.

Finally, using matched worker-plant panel data from the US, Tate and Yang (2015) show that women workers who move from the same closing plant to the same new plant experience a greater wage drop than comparable men workers. They also document that this gap is significantly smaller in hiring firms with women's leadership, thus concluding that women leaders are more gender-sensitive than men leaders.

Overall, studies on the impact of women leaders on wages and discrimination seem to point to women leaders having a positive effect. It seems that women leaders contribute to reducing the gender differences in the wage drops associated with job loss, to reducing the gender wage gap (even if, according to Bertrand et al. (2014), this result is not significant), and to reducing gender discrimination in career advancements.

2.5.2.4. *Women entrepreneurs and economic outcomes*

'Female leadership' is a broad concept. Women leaders in private companies are top managers, CEOs, presidents, directors and also entrepreneurs.

As discussed in Avolio Alecchi and Radovic-Markovic (2013), 'entrepreneurship is an emerging research area among academics because it is acknowledged that fostering entrepreneurial activity is associated with greater economic growth'.

Moreover, since women are becoming increasingly important in fostering entrepreneurship activities, assessing whether there are peculiar economic effects associated with them is particularly relevant (Alecchi and Radovic-Markovic, 2013).

Matsa and Miller (2014) find positive spill-overs in terms of lower mass layoffs carried out by women entrepreneurs during the economic recession of 2006-2009. Amore et al. (2015) show that gender interactions at the top of the firm (specifically, between the entrepreneur and the CEO) are important for boosting firm productivity.

Notably, Cuberes and Teigner (2015), using a general equilibrium occupational choice model where individuals have random entrepreneurship skills, quantify the effects of gender gaps in entrepreneurship and workforce participation on aggregate productivity and income per capita. The findings show that gender inequality creates an average income loss of 14 % in the short run and 15.4 % in the long run for the OECD countries and that, on average, 40 % of these losses are due to entrepreneurship gaps. The model also estimates an average income loss of 16 % in the short run and 17.5 % in the long run for a sample of developing countries.

2.6. The economic benefits of women in politics

2.6.1. Background

An established result both in experimental and survey-based literature is that women have different preferences, attitudes and behaviours compared to men.

For instance, Eckel and Grossman (1998) conducted a dictatorship experiment designed to permit the emergence of gender differences in economic behaviour, and find that women tend to be more socially oriented when taking economic decisions, while men tend to be more individually oriented. Indeed, women are found to donate up to twice as much as men to anonymous recipients.

Ones and Viswesvaran (1998), examining just under 800 000 employment integrity tests of US job applicants in private industry, find that women obtain a significantly higher average score, thus suggesting that they are more trustworthy and less corruptible than men.

Moreover, women tend to be different from men concerning political ideas. They are generally found to favour redistribution more often, to support child-related expenditures, and to be more liberal.

Alesina and La Ferrara (2005), using a long panel data set on US individuals providing information on sociopolitical preferences and a set of individual characteristics (e.g. age, gender, socio-economic background, etc.), find that women are significantly more likely to favour redistributive policies, when keeping constant many possibly confounding factors such as age, race and education.

Miller (2008) uses the introduction of women's suffrage in the US between the late 19th and early 20th century to assess whether women have different political preferences compared to men. Using data on child mortality at the state level, he shows that the advancement of women helped to reduce child mortality over the years, because women electors favoured policies aimed at improving children's health (e.g. relating to the introduction of new vaccinations). His identification strategy relies on the fact that US states adopted women' suffrage at different points in time, thus allowing a simple diff-in-diff estimation to be performed.

On the basis of the suggestion that women are becoming increasingly left-leaning, Edlund at al. (2005) trace this trend back to the decline of marriage. Using the German Socio-Economic Panel (GSOEP) data set on individuals, they show that transitions out of marriage make women significantly more likely to become left-leaning. Moreover, using data on public expenditure for nine high-income OECD countries over the 1980-1999 period, they show that the rise in unmarried women is significantly related to the rise in childcare expenditure.

2.6.2. The impact of women politicians on policy determination

Such gender differences in behaviour and political ideas may materialise in the differential impacts of women and men in leadership positions, both in the private sector and in politics. While studies examining the impact of women leaders in private companies are numerous and their number is constantly increasing, the same does not apply to research on the economic impact of women in politics. Nonetheless, it is possible to identify two broad categories

of research on the latter topic: studies that investigate the impact of women politicians on policy determination and studies concentrating on their impact on government effectiveness.

Concerning the first group, the literature agrees on the suggestion that women politicians prioritise social issues and that they favour redistributive policies.

Thomas and Welch (1991), concentrating on a cross-section of members of the lower houses of 12 US state legislatures in 1988, find that women legislators are not significantly different from their male counterparts in terms of legislative activities. Indeed, they do not significantly differ in the degree of introduction and passage of bills. However, women are found to have somewhat different policy priorities compared to men, in that they tend to support more intensively gender-sensitive policies and seem to prioritise them more than men legislators.

Thomas (1991), using the same data set as Thomas and Welch (1991) to explore the relationship between the percentages of women in US state legislatures and their policy priorities, finds that US states with a larger fraction of women in politics are associated with a significantly higher level of activity when it comes to issues relating to women, children and families, as measured by the numbers of priority bills introduced and passed. She concludes, therefore, that women significantly contribute to shaping policy determination in the US.

Case (1998), using a panel data set on US states for the 1978-1991 period, finds that child support enforcement policies were significantly strengthened (higher rate of passage of several child support laws) in states where the number of women legislators was higher. This result persists after controls for fixed effects, state effects and several time-varying economic variables at the state level, such as the proportion of elderly and black people and the rate of employment.

Using data for the 48 continental US states over the 1950-1999 period, Besley and Case (2003) find that a higher fraction of women legislators in the states' lower houses is significantly and positively related with expenditure on family assistance per capita, while a higher proportion of women in the upper houses is associated with a significant increase in the degree of child support enforcement. These results are robust to controlling for state and year fixed effects and a large series of time-varying state-level controls, such as the distribution of the population by age and its average income.

However, the previous findings cannot be given a causal interpretation, since they do not deal with possible endogeneity problems stemming from the omitted variable and simultaneity issues.

Indeed, as highlighted by Clots-Figueras (2011) in India, electorates that elect women politicians are arguably different from those that do not and the characteristics that differ may influence political decisions through other channels (omitted variable problem). For instance, it may be that there is a higher fraction of women politicians in countries naturally more sensitive to social issues related to women and children. If this is the case, higher fractions of women in politics would be found together with a greater level of government activity in the area of social policy. Therefore, not controlling for such unobserved heterogeneity may possibly hinder the identification of the causal effect of interest.

Moreover, it may be the case that women politicians not only influence policy outcomes but also that policy programmes influence women's participation in politics (simultaneity problem). For instance, governments that more often implement policies in favour of gender equality may contribute to the increase in women in leadership positions, in the private sector and also in politics. Again, not controlling for this simultaneity problem can prevent the identification of the causal effect.

Only a few papers deal with endogeneity problems so that it is possible to extract a causal interpretation from their conclusions.

Svaleryd (2002), using a survey on Swedish local councils, investigates whether the degree of women's representation in such institutions influences the patterns of public expenditure. In order to deal with problems stemming from time-invariant unobserved heterogeneity (i.e. the 'culture' of a local council), she performs fixed effects regressions. Moreover, she also deals with the simultaneity problem by exploiting the instrumental variable approach. In particular, besides implementing the famous system GMM estimation (Blundell and Bond, 1998), Svaleryd exploits the changes in the number of seats in the local councils as an external instrument. She finds that a greater share of women in the local municipalities is associated with a significant increase in expenditure on childcare relative to the care of the elderly.

Clots-Figueras (2011), using data from 16 larger states in India, exploits close elections as an identification strategy and finds that the gender of the legislators matters for policy determination. In particular, women legislators are found to have a positive impact on policies investing in health and early education, to favour gender-sensitive laws, and to support redistributive policies. However, she shows that the social position (i.e. caste) is also an important predictor of women's impact on policies. Indeed, the latter result applies only to women legislators in seats reserved for lower castes and disadvantaged tribes. Women legislators belonging to higher castes, on the contrary, are not found to have any

impact on women-friendly laws, and seem to limit redistribution, to support investments on advanced rather than primary education, and to reduce social expenditure.

2.6.3. The impact of women politicians on government effectiveness

Relating to the second group of studies, that is, those examining the impact of women politicians on the functioning of governments, there is a large consensus on women's beneficial impact.

As reported by Paxton and Hughes (2007) in a comprehensive book about the global situation of women in politics, there is a large consensus on the fact that women politicians are more likely to cooperate and to work alongside members of the opposite political party when it is important to reach a decision in a short time. Moreover, there is compelling evidence that women are more concerned with satisfying the population's needs, while men concentrate more often on increasing their own political power. Indeed, as discussed in Paxton and Hughes (2007), women are more likely to use political power as 'a way to get things done' as opposed to a means of controlling or influencing others.

Iwanaga (2008), conducting a large number of interviews with women politicians in both the lower and the upper house of the Thai parliament in 2002, reports that women are more likely to propose new and creative solutions to problems, while their male counterparts usually rely on standard approaches which, in turn, they implement in a more authoritative way. He also reports that parliamentary women tend to make more responsible choices in voting than men, conscientiously considering the effects of a bill, as opposed to voting on the basis of how the vote would affect her career. This is coupled with the fact that women politicians 'expressed a motivation for entering politics that could be more or less characterised as civic-oriented'.

Finally, in keeping with the strong evidence that women politicians are less prey to corruption than their male counterparts, Dollar et al. (2001) find that higher fractions of women politicians are associated with significantly lower levels of corruption in a sample of more than 100 countries. This result is robust to controls for a wide range of variables, ranging from the country's GPD, population, ethnic diversity and schooling, to regional dummies. Other studies have investigated the gender attitudes towards corruption and tax evasion (Torgler and Valev, 2010; Beaman et al., 2009; Swamy et al., 2001), finding that there is a significantly greater aversion to corruption and tax evasion among women.

Baltrunaite et al. (2014) examine the impact of gender quotas on the quality of politicians. Gender quotas were

introduced in Italian local municipalities in 1993 and were in force until 1995. Since the period covered by the reform was very short, some municipalities never voted under the gender quota regime. This allows the authors to use a diff-in-diff approach. They find that gender quotas have significantly contributed to an increase in the quality of politicians, as measured by years of schooling. They also find that this positive effect persisted in the long run and is robust to controlling for political ideology and competition.

Exploiting the same law on gender quotas in Italian local municipalities, De Paola et al. (2010) analyse the impact of such quotas on women's involvement in political activity. They show that women's representation in politics after the reform increased significantly more in municipalities that were affected by the reform than in municipalities that were not affected. Therefore, they conclude that gender quotas can be helpful in breaking down negative stereotypes against women.

Bonomi et al. (2013) examine the impact of gender quotas introduced in regional elections in Italy in 1995 on votes for women candidates. The Italian regional electoral system allows voters to choose both the party and the specific candidate according to an open-list proportional system. The authors calculate that a 50 % gender quota in candidate lists is related to a substantial increase in the probability that voters will choose women candidates, from 12 to 36 %.

In conclusion, while the literature on the impact of women politicians is rather limited, it is unanimous on the results. Women politicians seem to take into greater consideration social issues as well as to render governments more 'clean' and effective. Therefore, increasing women participation in politics, besides being a matter of justice and ethically desirable, seems also to have relevant political and economic benefits.

2.7. The economic benefits of ending violence against women

The literature on the economic benefits of eliminating violence against women focuses on the annual cost of such violence, borne by society or by the victims, and usually it does not assess the impact of such violence on GDP growth or economic development.

In addition, with respect to other domains, a number of issues emerge that are worth mentioning.

First, estimating the cost of gender-based violence requires a number of different data: the extent of gender-based violence (prevalence, frequency, severity); the utilisation of services; the direct impact on victims; the impact of the violence on the employment of victims; the value placed on the reduced quality of life. Most of these data are not easily available, and even when they are, they are likely to be underestimated (e.g. the extent of violence). It is well known, for instance, that victims tend to underreport episodes of violence to health services or to the police. On the other hand, representative surveys have scarce information on service utilisation. For this reason, additional information sources are needed. The following ones have been used, and are listed in EIGE (2014): expert judgement, victim recall, administrative data, population data sets, studies of similar harms, and specialised research projects. With the exception of expert judgement and victim recall, each one of the others has some positive aspects. If the extent of gender-based violence is underestimated, obviously the costs will also be underestimated, an issue which does not emerge with other gender gaps, which are instead easily measured, at least in developed countries.

Second, which types of costs should be included may be a matter of discussion. While most studies include provision of services (health, legal, specialised) and lost economic output, only some also include the personal (physical and emotional) impact on the victim. The rationale for including the personal impact, for EIGE (2014), is that it is included in fields which compete for resources with gender-based violence. However, it is also the most difficult to account for. The choice of which items should be included may lead to different evaluation of the costs.

Third, violence against women is defined as 'any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life' (United Nations, 1993, Art. 1), perpetrated by an intimate partner (former or current), in the household, or in the community, namely by non-household members. However, most studies focus on violence committed by partners (intimate partner violence, IPV), which is only a subset of gender-based violence (GBV), because data for the former are often of better quality (EIGE, 2014). Attention should be paid to which of the two is considered in order to understand additional differences among the studies.

2.7.1. The economic costs of gender-based violence

The most comprehensive and best informed report on the costs of violence against women is EIGE (2014). After a discussion of the most important studies on the theme, EIGE chooses seven domains to be included in order to estimate the costs, and the recommended models (which mainly draw on UK experience).

(i) **Lost economic output**: days of lost productivity of paid and unpaid labour (multiplied by the number of IPV homicides and survey-based estimates of the extent of violence).

(ii) **Health**: physical injuries and long-term mental and physical health impacts, which are reflected in immediate treatments and longer-term treatments. Their cost is estimated using the 'health losses' models, namely the time spent in less than hypothetical perfect health because of exposure to gender-based violence, as quality of life years (QALY) losses.

(iii) **Legal sector**: (a) criminal justice costs (e.g. police service costs, legal aid, court cost, prosecution costs, forensic services, prison costs, conditional sentencing, etc.): costs estimated using a model for the economic analysis of crime (percentage proportions of crime, stratified by severity) and 'no-crime' (police workload in which the police have been called to respond to an incident that was deemed not to meet the legal threshold of a criminal offence); (b) civil justice costs, estimated with a proportional expenditure approach.

(iv) **Social welfare**: housing aid, financial assistance, child protection and family support.

(v) **Personal costs**: damage to property, enhancing phone security, moving expenses, home repossession, legal costs, lone parenting: estimated using unit costs from administrative data or research, multiplied by the number of people reporting occurrence of those acts.

(vi) **Specialised services**: victim-centred interpersonal intervention (refuge, telephone helplines, victim support centres, counselling and advocacy) and specialist government intervention (coordinating functions). The cost is estimated considering the total expenditure (administrative data).

(vii) **Physical and emotional impact**: cost of QALY health loss per incident (multiplied by the number of IPV homicides and survey-based estimate of the extent of violence).

The cost is estimated for the UK (2012), which has one of the best statistical systems on gender-based violence, and then extrapolated for each Member State and the entire EU on the basis of the population. EIGE estimates a cost of EUR 13.7 billion resulting from IPV against women (EUR 15.4 billion for total IPV), 48 % of which is due to the physical and emotional impact, 15 % to criminal justice system costs, 12 % to lost economic output, and the rest divided among the other items. GBV against women is estimated

to cost EUR 28.4 billion (EUR 32.6 billion for total GBV), of which 59 % is due to the physical and emotional impact. The extrapolated data for the EU are: EUR 109.1 billion for IPV against women (EUR 122.2 billion for total IPV) and EUR 225.8 billion for GBV against women (EUR 258.7 billion for total GBV).

In comparison with the following studies, EIGE (2014) estimates the cost of IPV (GBV) as follows: for France, EUR 14.1 (EUR 29.2) billion; for Italy, EUR 12.8 (EUR 26.6) billion; for Denmark EUR 1.2 (EUR 2.5) billion; and for Sweden EUR 2.1 (EUR 4.2) billion.

A number of other studies try to estimate the cost of intimate partner violence or gender-based violence at the national level. The main differences, with respect to EIGE (2014) and among the studies themselves, are the items included (both in the 'general' item, and in the sub-items included for each category). Often some items are not included simply because necessary data are missing. In addition, the methodology followed to estimate the cost may change slightly (item cost per violence, multiplied by number of cases; estimation of total costs, etc.) [42].

The main results for the **annual** costs of IPV in some of the Member States of the EU are summarised below:

■ GBP 22.8 billion for England and Wales in 2001 (Walby, 2004), decreasing to GBP 15.7 in 2008 (Walby, 2009) thanks to a decrease in domestic violence. The estimates include the criminal justice system costs, physical and mental health costs, social services and child-related costs, housing costs, civil legal costs, lost output, and human and emotional costs.

■ SEK 2.7-3.3 billion for Sweden in 2004 (Envall and Eriksson, 2010), a figure which includes healthcare services, criminal justice system costs, victim support, social services, the social insurance system and production loss.

■ EUR 2.5 billion for France in 2006 (Nectoux et al., 2010), including healthcare, social and justice services, production loss, and some human costs (rape and prejudice).

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[42]   A different approach is followed by Santos (2013), who estimates the cost of domestic violence in the UK. She uses individual data on self-reported life satisfaction and estimates a life satisfaction regression equation on income and domestic violence. The individual cost of domestic violence is extrapolated using the marginal rate of substitution with respect to household income. Santos estimates that past experiences of domestic violence costs around GBP 27 000 to the woman victim, while current exposure to domestic violence costs her around GBP 73 000.

The **annual** costs of GBV in the EU in national studies have been estimated at:

- GBP 40.1 billion per year in England and Wales in 2006-2007 (Järvinen et al., 2008), including all the previously mentioned costs of domestic violence, but also costs of sexual violence, violence against minority ethnic women, prostitution and trafficking.

- EUR 17 billion for Italy in 2006 (Intervita, 2013), including health and mental health costs, criminal justice costs, police costs, specialised centres, productivity loss, and loss of quality of life.

- EUR 70 million for Denmark in 2009 (Helweg-Larsen et al., 2010), including health services, police and judicial system costs, specialised centres, short-term production losses, and prevention.

Outside Europe [43], IPV has been estimated to cost per year:

- USD 5.8 billion for the US in 1995 (National Center for Injury Prevention and Control (NCIPC), 2003), a figure which includes direct medical and mental healthcare services, lost productivity (paid and unpaid labour and lifetime earnings for victims of homicide).

- USD 8.1 billion for Australia in 2002-2003 (Access Economics, 2004), a figure which includes pain, suffering and premature death, reduction in potential living standards, production-related costs, consumption-related costs, second-generation costs, administrative and other costs and transfer costs. The National Council to Reduce Violence against Women and their Children (NCRVAW&C) (2009) estimates the cost of GBV for Australia at USD 13.6 billion (in 2007-2008).

- USD 4.8 billion for Canada in 2009 (Zhang et al., 2012), a figure which includes the costs of the criminal and civil justice system, healthcare, mental health issues, productivity losses, personal costs, intangible costs (loss of quality of life due to pain, suffering and anxiety).

- CHF 164-287 million for Switzerland in **tangible** *costs* (police and justice system, support services, specialist agencies, healthcare costs, lost productivity) and CHF 2 billion in **intangible** costs (loss of quality of life due to pain, suffering and anxiety) (Stern et al., 2013).

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[43] A substantial body of literature also concerns developing countries. Please refer to the reviews by the Council of Europe (2012) and by Duvvury et al. (2013).

2.7.2. Indirect impacts

Violence against women may have an indirect effect on GDP, since it affects other outcomes, such as women's employment and wages, and health. Bowlus and Seitz (2006) do not find that domestic violence has any causal effect on employment. On the contrary, Sabia et al. (2010) show that sexual violence against women is associated with 6.6 % lower probability of labour force participation and 5.1 % lower wages. These effects partially arise due to stress disorders and physical health consequences of violence (but not entirely).

According to the World Health Organisation (WHO) (2013), women who have been victims of intimate partner violence have higher rates of health problems: they are 16 % more likely to have a low-birth-weight baby; twice as likely to have an abortion; and twice as likely to experience depression. Women who have been victims of sexual violence by a non-partner are 2.3 times more likely to have alcohol use disorders and 2.6 times more likely to experience depression or anxiety. As mentioned above, health problems are one of the channels which impact on the labour market outcomes of abused women.

2.7.3. Reducing gender-based violence: a virtuous circle

Finally, gender-based violence is considered a 'manifestation of historically unequal power relations between men and women … and it is one of the crucial mechanisms by which women are forced into a subordinate position compared to men' (United Nations, 1993). This quotation summarises the fact that GBV not only reinforces gender differences (as we have just seen), but that it itself is one of the consequences of economic inequalities. Violence against women is affected by the relative bargaining power of women: as such, it is influenced by economic inequalities.

Aiser (2010) develops a household bargaining model that incorporates domestic violence: the prediction is that increasing a woman's relative wage increases her bargaining power within the couple and lowers the level of violence. Interestingly, what matters is the potential relative wage, and not the actual absolute wage. There is an important implication: improving the labour market conditions for women will decrease the overall level of domestic violence, even in families where the woman does not work. Using administrative data for California for the 1990-2003 period, Aiser shows that closing the gender wage gap by 3.6 percentage points (real change) explains 9 % of the reduction in violence against women observed during the period.

Research carried out by Anderberg et al. (2015) refers to the same theoretical framework. Empirically, the authors

show that: (i) an increase in men's unemployment (+ 1 p.p.) reduces domestic violence (- 3 %); (ii) an increase in women's unemployment (+ 1 p.p.) increases domestic violence (+ 3 %); and (iii) an increase in total unemployment has no effect on domestic violence. They use both OLS regressions and instrumental variable techniques to address endogeneity issues. Similarly, Bowlus and Seitz (2006) show that employment acts as a significant deterrent.

It can thus be concluded that reducing economic inequalities can reduce domestic violence and thus decreases its costs to the economy. In turn, this may have an additional positive effect for the economy of the country. Furthermore, reducing violence against women improves women's employment and wages, and thus creates a virtuous circle that is positive for both women and society as a whole.

2.8. The impact of health on economic outcomes

2.8.1. Background

In almost all western countries, women experience longer life expectancy but higher rates of disability, more chronic debilitating illness, particularly in later life, and poorer health than men (the so-called male-female health-survival paradox). This paradox is explained by both biological and environmental differences that include behavioural, cultural, and social factors (Case and Paxson, 2005; Oksuzyan et al. 2010).

Women are less frequently hospitalised and less frequently therapeutically treated compared to men, particularly when it comes to diseases traditionally perceived as men's diseases (the so-called 'Yentl syndrome', see Healy, 1991). Women are less or not at all represented in experiments for introducing new drugs and/or new diagnostic and therapeutic technologies. Similarly, many research studies on prevention, diagnostic methods and intervention have been conducted in exclusively male populations; as a consequence, physicians might incur problems in the correct and timely diagnosis of diseases in women (Healy, 1991).

The role of health on the economic development of societies is widely acknowledged. There is a great deal of literature, starting from the model developed by Grossman (1972), where investments in health are analogous to other forms of investment in human capital such as education. Literature findings document a positive relationship between various measures of health and labour supply, employment, wages or income (Strauss and Thomas, 1998; Smith, 1999; Haveman et al., 1995).

However, identifying the direction of the causal relationship is not straightforward. Causality can run in both directions. As income grows, individuals invest more in human capital, including health. On the other hand, considering health as one dimension of human capital, improvements in health will entail returns in the labour force. Healthier workers are more productive and command higher hourly earnings. Much of the literature linking health and labour market outcomes focuses on developing countries, because the link between health and work appears more significant in societies in which many prime age adults are in poor health.

2.8.2. Potential channels through which reducing the gender gap in health may affect macroeconomic performance

According to Bloom et al. (2015), there are four channels through which reducing the gender gap in health may yield positive economic outcomes: (i) healthy women have higher labour force participation rates for any given level of education; (ii) better health (lower morbidity and mortality) increases the returns on educational investments and thus productivity; (iii) better health of mothers directly affects the health of children, thereby improving development prospects over the long run through direct intergenerational transmission of human capital; and (iv) better women's health may lower fertility and thus youth dependency with a further cumulative effect on women's labour participation and educational investments. Although the latter channel appears to matter the most for developing countries, the other three channels are relevant for developed countries as well.

As pointed out by Currie and Madrian (1999), the empirical evidence suggests that health has a pervasive effect on most labour market outcomes including wages, earnings, labour force participation, hours worked, retirement, job turnover and benefits packages. However, there is no consensus about the magnitude of the effects or about their size relative to the effects of other variables. This is because many studies do not deal with measurement error and the endogeneity of health. Furthermore, estimates of the effects of health on labour supply are relatively sensitive to the measure used. In addition, they also highlight the lack of studies that analyse gender differences in labour market behaviour as a response to health shocks. In fact, relatively few studies examine women and men separately, making it difficult to make generalisations about gender differences where studies refer to the whole population or to men only ([44]).

([44]) Luft (1975) is one of the earliest papers to distinguish between women and men when presenting the results; many early papers (Bartel and Taubman, 1979; Berkowitz et al., 1983) involved analysis of men only.

Box 1.2   Most used measures of health

Another important issue in this field relates to the measurement of health (Currie and Madrian, 1999). Studies use different measures of health:

(i) self-reported health status (usually ranked as excellent, good, fair or poor health);

(ii) limitations on the ability to work; problems with activities of daily living;

(iii) the presence of chronic and acute conditions; the utilisation of medical care;

(iv) clinical assessments of mental health or alcoholism;

(v) nutritional status (e.g. height, weight, or body mass index);

(vi) expected or future mortality.

While studies on developing countries often focus on measures of nutritional status, the majority of studies on more developed countries focus on self-reported health status, health limitations, or utilisation of medical care.

Different studies focus on the relationship between health and wages. For instance, Strauss and Thomas (1998), using the National Longitudinal Survey of Youth, show a strong and positive correlation between adult height and hourly wages in the US and Brazil in the 1970s. Messer and Berger (2004), using the US Health and Retirement Survey, find that permanent adverse health conditions reduce both wages (8.4 % for men and 4.2 % for women) and hours worked (6.3 % for men and 3.9 % for women).

Other studies analyse the impact of poor health on the probability of experiencing unemployment spells. García-Gómez and López-Nicolás (2006) analyse the effects of a health shock on the probability of leaving employment and moving to unemployment or inactivity within the Spanish population. They find that suffering a health shock decreases the probability of remaining in employment by 5 % and increases the probability of transiting into inactivity by 3.5 %. Similar results are also found for other European countries (García-Gómez, 2008).

Böheim and Taylor (2000) use calendar data from the first seven waves of the British Household Panel Survey to analyse transitions from unemployment to part-time work, self-employment and economic inactivity for a sample of British workers. Their results show that the existence of a health condition that limits the type or amount of work observed before an unemployment spell doubles the exit rate from unemployment into economic inactivity.

Concerning the different effect of health on the labour market outcome of women and men, Gomez et al. (2010) find that an individual's own health is an important determinant of employment transitions and that there are significant differences between women and men. They use

data from the first 12 waves of the British Household Panel Survey (1991-2002) and measure health by health limitations, a constructed latent health index and a measure of psychological well-being. Their results show that health affects exits out of and entries into employment and that the effects are higher for men than for women.

A different group of studies has focused on the role played by health in retirement transitions. These studies show that decreases in health status are among the main causes of retirement among older workers (Disney et al., 2006; Zucchelli et al., 2007). All other things being equal, decline in health status may reduce the probability of continued work for three reasons (Disney et al., 2006): poor health may raise the disutility of work; poor health reduces the returns from work via lower wages and by entitling individuals to non-wage income, through disability benefits; and poor health may act as an incentive to exit the labour market.

2.8.3.   The role of maternal and reproductive health on macroeconomic performance

An important strand of the literature concerns maternal and reproductive health. Reproductive, maternal, newborn and child health (RMNCH) is fundamental to development, and is reflected in the Sustainable Development Goals (SDG) 3 (Ensure healthy lives and promote well-being for all at all ages) and 5 (Achieve gender equality and empower all women and girls). For western countries, existing literature has investigated the impact of improved maternal health on different economic outcomes.

Albanesi and Olivetti (2009) showed that improved maternal health was critical to the rise in the labour force participation of married women during the 20th century and especially

during the baby boom, generating a rise in income per capita of over 50 % via this channel. These results suggest that improving maternal health may have long-lasting effects on standards of living, even without a decline in fertility. Albanesi (2012) found that large maternal mortality reductions in 25 advanced and emerging economies between 1900 to 2000 were associated with a boom-bust pattern in fertility and a permanent rise in women's human capital. Finally, Albanesi and Olivetti (2014) conduct an empirical study of the impact of maternal mortality reduction on fertility and women's educational attainment, exploiting its variation across US states and cohorts. Their findings suggest that the growth in fertility was highest for US states and cohorts of women that experienced the greatest reduction in maternal mortality. Moreover, they show that the decline in pregnancy-related mortality had a sizeable impact on the rise in the women-men differential in college graduation.

Other studies have focused on the role of oral contraception ('the pill'). Studies in this field, seeking to identify any causal effects of the pill on outcomes for young women in the US in the 1960s and 1970s, have relied on a natural experiment arising from state differences in confidential access to the pill for unmarried women under the age of 21.

Goldin and Katz (2002) present evidence for the impact of the pill on young women's career decisions and on marriage rates in the 1970s. They argue that the introduction of the pill to young and unmarried women loosened the trade-off between family and working career. The pill further reduced the cost of career investment for women by serving to increase the age at first marriage for a large fraction of all young people. Thus, the role of the pill in affecting women's careers was magnified by its impact on the age at first marriage.

Subsequent work has extended this framework to produce additional evidence on the 'power of the pill'. Hock (2008) and Ananat and Hungerman (2012) show that access to the pill affected college enrolment and education and that access to contraception at younger ages improved the economic resources and long-run outcomes of children born. Bailey (2006) shows that early access to the pill increased women's labour force attachment; Zuppan (2012) documents the role of the pill on increased marital stability.

Bailey, Hershbein and Miller (2012) show that legal access to the pill had broad effects on lifetime wage earnings and that 30 % of the convergence of the gender wage gap in the US in the 1990s can be attributed to the increased legal availability of the pill.

Albanesi and Olivetti (2015) find that improvements in maternal health were critical to the joint evolution of married women's participation and fertility in the US during the 20th century. They show how a decline in maternal mortality induces a temporary rise in fertility and a permanent rise in women's human capital. These findings suggest that medical progress can provide an integrated explanation for the secular decline in fertility — the baby boom and bust — as well as for the overall rise in human capital and the gains in women's human capital relative to men in the post-war period.

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3.
Annex:
Selected methodological approaches

Building on the results of the literature review at EU and MS levels, the study team selected five examples to be reviewed in greater depth and explored how they compare to the E3ME model and can inform the subsequent phases of the study. The EU and MS literature review served as a long list of potential examples, and a short list of examples was developed based on several criteria, focusing on added value in terms of methodology and learning effects.

The criteria that were used in the selection process are summarised in the table below.

Criteria for selection of good practice examples

Name of criterion	Nature of criterion	Type of criteria	Examples of types of questions to assess criterion
Methodological illustration	Examples must illustrate different methodological approaches that identify economic benefits of gender equality. The following approaches were the most relevant for this: – macroeconomic model with single or multiple equation systems; – micro-econometric analysis (including experimental and quasi-experimental studies); – other econometric analysis (such as meta-analysis); – impact assessments/cost–benefit analysis.	*Core*	■ What methodological approach and type of measurement does the example represent? ■ How established is the method used in the body of the literature? ■ How innovative is the methodology used in the body of the literature?
Methodological robustness	Examples chosen must have considered bias in their analysis and adopted clear approaches to eliminate them. This relates for example to: – statistical significance of results; – correct identification of channel through which gender equality affects economic outcomes; – inclusion of all relevant control variables; – treatment of deadweight; – issues with causality; – controlling for result bias; – multicollinearity; – robustness checks.	*Core*	■ Does the example clearly identify any potential bias in terms of methodological approach and analysis? ■ Have the identified biases been assessed and addressed? ■ How robust are the methodologies used compared to the current body of research in this area?

Name of criterion	Nature of criterion	Type of criteria	Examples of types of questions to assess criterion
Learning effects — Key links between gender equality and economic benefits	Example demonstrates important connection between gender equality and economic outcomes for overall population or specific sub-groups in one of the following areas of gender equality: – education; – labour market; – time use; – leadership; – violence against women; – health; – migration.	*Core*	■ Does the example demonstrate a certain type of connection between gender equality and a certain type of economic benefit? ■ Can it be used as a 'best of its kind' to represent the particular connection between gender equality and economic benefits?
Learning effects — Identification of effects of gender equality at macroeconomic level	Examples illustrate how to link gender equality to macroeconomic outcomes. The examples should demonstrate the following: – the main types of macroeconomic indicators used for modelling of impacts of gender equality; – links between microeconomic and macroeconomic evidence; – magnitude of impacts of gender equality at macroeconomic level.	*Core*	■ What types of macroeconomic indicators does the example use to demonstrate impacts of gender equality on macroeconomic outcomes? ■ How does the example incorporate microeconomic evidence into macroeconomic modelling? ■ What size of macroeconomic effects does the example identify?
Learning effects — Sustainability and inclusiveness	Examples chosen must consider if economic benefits of gender equality are sustainable and inclusive. This can be done, for example, through assessing if gender equality leads to: – poverty reduction; – more equal income distribution; – better living conditions; – more environmentally friendly choices; – one-off change or sustained change.	*Core*	■ How does the example measure inclusiveness and sustainability of the economic impact of gender equality? ■ What main effects in terms of sustainability and inclusiveness does the example illustrate?

The selected examples were analysed in depth and the findings were presented in a standardised template. The detailed presentation of the examples follows the criteria used in the selection and described in the previous table, namely:

■ key characteristics;

■ eligibility in relation to selection criteria: methodological illustration; methodological robustness; learning effects; geographical representativeness;

■ description of the example: context; gender equality problem addressed; variable used to measure gender equality; aims and objectives; data sources; indicators used to demonstrate the macroeconomic impact of gender equality; analytical method used;

■ lessons learnt: outcomes and results; methodological considerations; and lessons for future research.

The following table summarises the key characteristics of the five selected examples, which are presented in detail in the subsequent sections.

Overview of the five selected methodological examples

	Methodological example	Macroeconomic indicator	Evidence of economic impact	Description of empirical approach
Labour market — Participation	Mitra et al. (2015) *'Gender equality and economic growth: is it equality of opportunity or equality of outcomes?'*	GDP per capita growth rate	Increasing gender equality improves the growth of GDP per capita. A standard deviation improvement in the *equality of opportunity* increases growth by 1.30 percentage points, and a standard deviation improvement of *equality of outcomes* improves growth by 1.19 percentage points.	Regression analysis (Framework of a standard growth model, with additional measures of gender equality, with a single equation model). **Data used:** World Development Indicators (WDI) data 1985-2000
Labour market — Participation, self-employment and entrepreneurship	Cuberes and Teignier (2016) *'Aggregate effects of gender gaps in the labor market: a quantitative estimate'*	Income per capita and aggregate productivity	Exclusion of women from entrepreneurship and from the labour market would generate income per capita loss. The average income loss due to gender gaps is 14.1 % to 15.4 % (short-/long run). The income loss due to the gaps in entrepreneurship and self-employment is about 5 % to 5.7 %.	Theoretical model, simulation and estimates. **Data used:** Data from OECD Social and Welfare Statistics and ILO for 2010 or latest available year

	Methodological example	Macroeconomic indicator	Evidence of economic impact	Description of empirical approach
Labour market — Participation	Esteve-Volart (2009) *'Gender discrimination and growth: theory and evidence from India'*	Per capita output	Exclusion of women from entrepreneurship and from the labour market would generate output per capita loss. An increase in the ratio of women-to-men managers in one unit would lead to a 319 % increase in per capita income. An increase in the ratio of women-to-men workers is associated with a 153 % increase in per capita income.	Theoretical model and estimates with a regression and IV. **Data used:** Census of India + country-level data for the 1961-1991 period
Economic decision-making — Leadership	Matsa and Miller (2013) *'A female style in corporate leadership? Evidence from quotas'*	Firms' policies (in particular, employment decisions)	Firms affected by the Norwegian law introducing quotas in the boardrooms of listed companies undertook fewer workforce reductions than comparison firms, increasing relative labour costs and employment levels and reducing short-term profits.	Quasi-natural experiment (diff-in-diff estimation) **Data used:** Firm-level data set on Nordic firms from 2003 to 2009
Economic decision-making — Leadership	Tate and Yang (2015) *'Female leadership and gender equity: evidence from plant closure'*	Wage policies of firms	Comparing workers who move from the same closing plant to the same new firm (after a plant closure), there are larger losses among women than men. There is a significantly smaller gap in hiring firms with female leadership.	Survey analysis (OLS, FE — with the inclusion of plant fixed effects — estimations). **Data used:** Employee-, plant- and firm-level US data set on from 1993 to 2001

3.1.   Methodological example 1: Labour market — Participation

Section	Field
Key characteristics	**Tool**: Mitra A., Bang J. T., and Biswas A., 'Gender equality and economic growth: is it equality of opportunity or equality of outcomes?', *Feminist Economics*, Vol. 21(1), 2015, pp. 110-135.
	Internal identifier: Mitra et al. (2015)
	Countries covered: 101 countries (including European countries).
	Year of publication: 2015
	Researchers: Aniruddha Mitra (Bard College, NY, USA), James T. Bang (St. Ambrose University, Iowa, USA), Arnab Biswas (University of Wisconsin-Stout, WI, USA).
	Analytical methods: - Exploratory factor analysis; - Macroeconomic model with single equation (regression analysis).
	Gender equality area: Education, labour market, leadership. **Measures**: - (inverse) fertility rate; - gender gap in literacy; - gender gap in secondary enrolment; - gender gap in labour force participation; - percentage of women in parliament.
	Time period: 1985-2000 (non-overlapping 5 year periods).
Eligibility in relation to selection criteria	**1. Methodological illustration** The paper discusses methodological concerns and explains the strategies used to address them, with a clear description and investigation of every aspect. The methods used are well known in the econometric literature; however, some of them have not been used before in articles investigating the economic benefits of reducing the gender gap in participation. In that sense, their usage is innovative. The example covers a large number of gender equality areas. **2. Methodological robustness** The example clearly identifies potential bias with a standard single equation regression and addresses them: - accounting for multiple aspects of gender inequality in a single empirical model: solved with exploratory factor analysis; - endogeneity and unobserved heterogeneity: which could be dealt with by means of the difference GMM estimator (see Arellano and Bond, 1991); - serial correlation within panels: solved with non-overlapping 5 year averages of variables and including some lagged variables; - underestimated standard errors: calculated heteroscedasticity-consistent robust standard errors using a jackknife technique and clustering. In addition, the authors address some possible concerns arising from their choices, and assess the robustness of the results to different specifications, which indeed confirm the results.

Section	Field
Eligibility in relation to selection criteria	**3. Learning effects** The example describes important connections between gender equality and economic outcomes in several areas of gender equality (education, labour market, leadership), with a section devoted to 'conceptual foundations'. It then explores these connection with the methodology described above. With respect to the paper investigating the connection between gender equality in employment and macroeconomic benefits, it addresses issues in terms of multicollinearity and endogeneity raised in previous papers (e.g. it made improvements with respect to Klasen and Lamanna, 2009). The only macroeconomic outcome used is economic growth (including a set of controls which are known to improve economic growth). Economic growth is measured with the average growth rate of GDP per capita. The magnitude of the impacts is described in terms of standard deviations, which helps understanding and comparison. However, the example does not link microeconomic and macroeconomic evidence, and it does not measure the inclusiveness and sustainability of the economic impact of gender equality. Moreover, it discusses the channel through which gender equality improves macroeconomic outcomes, though an underlying theoretical model is missing. **4. Geographical representativeness** The paper covers a large pool of countries (101), including all or most MS. The list of countries included is available as a supplemental table at: http://www.tandfonline.com/doi/suppl/10.1080/13545701.2014.930163
Description of the example	**Context** Mitra et al. (2015) explore the impact of gender equality on economic growth, building on previous literature, which has emerged as an area of inquiry in recent decades. While the number of studies which assess the impact of gender equality in education on economic growth is large and increasing, fewer studies have explored the consequences of gender inequality on employment. Those which have can be separated into a group which provides projections/simulations, and a group that has investigated the effects using the growth model developed by Barro (1991) and co-authors (Barro, 1991; Barro and Sala-i-Martin, 1995; Barro and Sala-i-Marin, 2004), augmented with measures of gender inequality. The present paper belongs to the latter group. With respect to previous studies, Mitra et al. (2015) address the multidimensionality of gender equality and issues related to endogeneity and unobserved variables. **Gender inequality addressed** The authors investigate the impacts of gender inequality in education, in employment and in political outcomes. **Variable used to measure gender equality** To do so, the authors consider five indicators of gender equality: the inverse of adolescent fertility rate, the gender gap in literacy, the gender gap in secondary enrolment, the gender gap in labour force participation, and the percentage of women in parliament. Gender gaps in literacy and secondary enrolment capture constraints on skills investments; the gender gap in labour force participation captures the consequences of biased resources allocation and the restrictions on women's access to employment; the inverse of the adolescent fertility rate captures fertility aspects of gender bias; the percentage of women in parliament captures the role of women in designing social policy.

Section	Field
	Aims and objectives
	The study aims at investigating the impact of gender equality on economic growth in a cross-national context.
	With respect to other studies, the paper is based on the assumption that gender equality is multidimensional, and that the various aspects may differ in their consequences. Considering only one of those aspects may lead to omitted variable bias. On the other hand, including all of them may be challenging, due to the high degree of collinearity. Thus, the paper intends to investigate the impact of gender equality in several fields on economic growth, addressing multicollinearity.
	Data sources
	WDI; Women in National Parliament Dataset (Inter-Parliamentary Union)
	Indicators used to demonstrate the macroeconomic impact of gender equality
	Annual growth rate of GDP per capita.
Description of the example	**Analytical method used**
	1. The impact of gender equality on economic growth is tested in the framework of a standard growth model, with additional measures of gender equality explored with a single equation model.
	The dependent variable is the average growth rate of GDP on non-overlapping 5 year periods (the 5 year periods ending in 1990, 1995 and 2000). Standard control variables included are: the log of GDP at the end of the previous period; the growth rate of GDP during the previous period; investment; government consumption; inflation rate; and secondary completion rate. In addition, there are two independent variables which assess the impact of gender equality.
	2. To account for multiple aspects of gender inequality in a single empirical model, Mitra et al. (2015) use EFA. This methodology is based on the assumption that each variable is generated by a linear combination of a smaller set of latent factors, which include common factors (which impact more than one observed variable) and specific factors (which are unique to each variable). EFA uses the common factors identified, which lend themselves to theoretical interpretation; in addition, they are free from a high degree of multicollinearity; lastly, they are less prone to measurement errors.
	The factors identified are **equality of opportunity** (secondary enrolment gap, inverse of the fertility rate, partial literacy rate gap) and **equality of outcomes** (labour force participation gap and percentage of women in parliament).
	3. To address endogeneity and unobserved heterogeneity, Mitra et al. (2015) employ the 'difference GMM' estimator (Arellano and Bond, 1991). This estimates the model in first differences, instrumenting the current differences with their lagged values, and uses the generalised method of moments (GMM).
	4. To address serial correlation issues in panels, the authors consider non-overlapping 5 year averages of the variables and include lagged values of the growth rate of GDP and lagged values of log per capita GDP.
	5. To have correct standard errors, they use a jackknife technique (Davidson and McKinnon, 1993) and clusters by country.
	6. In addition, they perform a number of sensitivity checks: they replace the total completion rate with male secondary completion rate, or exclude it completely; they test if results are robust to different choices of control variables; and they replicate the estimation for a balanced panel (45 countries).

Section	Field
	Outcomes and results
	Mitra et al. (2015) find that a standard deviation improvement in the **equality of opportunity** increases growth by 1.30 percentage points (statistically significant at 5 %), and that a standard deviation improvement of **equality of outcomes** improves growth by 1.19 percentage points (statistically significant at 5 %).
	The other variables have the sign predicted by the growth theory.
	To assess the impact on OECD countries, the authors use two strategies: in the first one, they separate the sample of OECD and non-OECD countries, and estimate the same model. They then interact the variables **equality of opportunity** and **equality of outcomes** with OECD countries. In both cases, they find that only gender equality in outcomes has a significant impact for OECD countries: a standard deviation improvement in equality of outcomes improves economic growth by 1.51 p.p. (statistically significant at 10 %) or by 1.91 p.p. (statistically significant at 5 %), depending on the specification.
	Their results are robust to different sensitivity checks.
Lessons learnt	**Methodological considerations and lessons for future research**
	The paper by Mitra et al. (2015) is a fundamental one in the literature on the economic benefits of gender equality.
	First of all, it addresses the issue of multiple aspects of gender equality, suggesting a way to include them without incurring multicollinearity. The approach of EFA seems to be a good tool for future research in order to include several aspects of gender equality in one regression. A disadvantage is the fact that each single aspect of gender equality cannot be disentangled when EFA is exploited.
	In terms of endogeneity, the difference GMM estimator seems to be a good approach in this strand of the literature. Nevertheless, looking for external instruments to exploit is still necessary, to confirm these results with slightly different approaches.
	The methodological rigour and the discussion of potential pitfalls and their solution are per se a good example to be followed by future papers.
	However, a GMM approach (difference GMM or system GMM) could not be applied in the present study in view of the high degree of heterogeneity in terms of labour market and economic structure across Member States. This approach would be suitable only in the case of either a set of countries (e.g. Nordic countries), which have plenty of similarities, or a selection of sectors which have similar behaviour across countries.
	Some highlights that can be drawn from a comparison between E3ME and the GMM technique are listed below:
	■ E3ME comprises several sets of behavioural equations which capture the dynamics of a single unit (e.g. 'agriculture' sector, 'mining and quarrying' sector, etc.), while panel data techniques are more suitable to model an equilibrium and identify common trends across the units.
	■ E3ME is estimated by applying cointegration techniques, which allow for the estimation of a cointegrating relationship, along with a short-run model which incorporates an error-correction term that shows the percentage of disequilibrium between the long-run and the short-run models which is eliminated in each period. This adjustment between the long and the short run cannot be captured by using other econometric techniques.

Section	Field
	Feminist Economics, Vol. 21, Issue 1, 2015 http://www.tandfonline.com/doi/full/10.1080/13545701.2014.930163
Sources	**Aniruddha Mitra** Bard College — Economics Programme 30 Campus Rd, Annandale-on-Hudson, NY 12504, USA Email: amitra@bard.edu **James T. Bang** St. Ambrose University — Department of Finance, Economics, and Decision Science 518 West Locust Street, Davenport, Iowa 52802, USA Email: BangJames@sau.edu **Arnab Biswas** University of Wisconsin-Stout — Department of Economics 712 South Broadway, Menomonie, WI 54751, USA Email: biswasa@uwstout.edu **Notes on contributors** **James T. Bang** is Professor of Economics at St. Ambrose University in Davenport, Iowa, and teaches courses on microeconomics, econometrics, international economics and the economic analysis of institutions. His research explores the topics of gender discrimination, international migration and institutions, with a focus on their impacts on developing countries. **Arnab Biswas** is Assistant Professor of Economics at the University of Wisconsin-Stout, where he teaches courses in microeconomics. His research has focused on discrimination in housing markets, as well as topics related to discrimination and economic development. **Aniruddha Mitra** is Assistant Professor of Economics at Bard College in Annandale-on-Hudson, New York, where he teaches courses on microeconomics and migration. His research investigates the phenomena of discrimination, conflict and international migration.

3.2. Methodological example 2: Labour market — Participation, self-employment and entrepreneurship

Section	Field
Key characteristics	**Tool**: Cuberes, D. and Teignier, M., 'Aggregate effects of gender gaps in the labor market: a quantitative estimate', *Journal of Human Capital*, Vol. 10(1), 2015, pp. 1-32.
	Internal identifier: Cuberes and Teignier (2016)
	Countries: 33 OECD countries (including EU countries); separate analysis for 106 non-OECD countries.
	Year: 2016
	Researchers: David Cuberes (Clark University, MA, USA), Marc Teignier (Universitat de Barcelona, Spain).
	Analytical methods: - theoretical model; - quantitative assessment of the model; - cross-country analysis (simulation).
	Gender equality areas: Labour market, leadership. **Measures**: - exclusion of women from the labour market; - exclusion of women from entrepreneurship.
	Years: OECD countries: 2010; non-OECD countries: last available years (1987-2011).
Eligibility in relation to selection criteria	**1. Methodological illustration** The paper dedicates a large amount of space to explain and discuss the theoretical model, which predicts the economic impacts of gender inequality in access to entrepreneurial activities and to the labour market. The theoretical implications of the model are also quantified. The effects are assessed with separated cross-country analyses for a sample of OECD and non-OECD countries. The theoretical model follows Lucas (1978), with some differences. As an innovation, Cuberes and Teignier (2016) add self-employment on top of employers and workers and include exogenous frictions that affect only women. **2. Methodological robustness** First, the empirical results are derived from the theoretical hypotheses, facilitating understanding of the mechanisms and interpretation of the results. Second, the empirical model is simulated separately for OECD and non-OECD countries, reducing the bias which may arise by pooling countries with different levels of development.

Section	Field
Eligibility in relation to selection criteria	**3. Learning effects** This paper shows a clear positive connection between gender equity (in entrepreneurship and the labour market) and income per capita. On the one hand, if all women were excluded from entrepreneurship, the income per capita would decrease by a sizeable 10 % in the short run. On the other hand, if all women were excluded from the labour force, the income per capita would decrease by as much as 47 % in the short run. Due to the methodological robustness (theoretical model) and its interesting implications, this paper is considered a good reference. The macroeconomic indicators used to explain the economic benefits of gender equality are income per capita and aggregate productivity. This paper incorporates microeconomic reasoning into macroeconomics by developing a micro-founded theoretical model. Results from this paper show that increasing women's participation in the labour market has marked benefits in terms of poverty reduction and growth. **4. Geographical representativeness** The example covers all or most of the EU countries. It covers all the EU countries that in 2010 were OECD members in the OECD sample. Some of the EU countries are in the non-OECD sample, generating potential difficulties in interpreting the results (e.g. they are in a very large sample of countries, including ones with different levels of development).
Description of the example	**Context analysis** Cuberes and Teignier (2016) investigate the impact of gender gaps in entrepreneurship and the labour force on aggregate productivity and income per capita. They build on previous literature, which shows the negative effects of gaps in the labour force and in education on a country's economic performance. There are also theoretical papers that show the impact of gender inequality on economic growth, and most are based on fertility and a child's human capital channels. In contrast, the authors of this paper focus on the talent pool channel. Moreover, they also calibrate and simulate the theoretical framework to produce reasonable estimates of the costs. The most similar studies are Esteve-Volart (2009), which focuses more on developing countries and tests the prediction of the model with a cross-country regression, but without providing estimates of the economic costs, and Hsieh et al. (2013), which examines the allocation of talent and US economic growth. The model used by Cuberes and Teignier (2016) is based on the span-of-control framework by Lucas (1982), adding self-employment and gender inequality in access to entrepreneurial activities and to the labour market. In addition, as a further extension, they introduce the possibility of out-of-necessity self-employment when the model is extended to developing countries. **Gender equality problem addressed** In the example, women face exogenous restrictions on their occupational choices. There are three types of constraints: (i) a fraction of women are excluded from entrepreneurship; (ii) an additional fraction of women are excluded from self-employment; and (iii) a fraction of women are completely excluded from the labour market. **Variable used to measure gender equality** In the empirical section, these restrictions are measured by the labour force participation by gender, the fraction of employers by gender, and the fraction of the self-employed by gender.

Section	Field
	Aims and objectives
	The paper aims to examine the quantitative effects of gender gaps in entrepreneurship and labour force participation on aggregate productivity and income per capita. To do so, it develops a theoretical model, extending an existing framework and, predicts the quantitative effects of a complete exclusion of women from employment or managerial positions. It also quantifies the effects of existing labour market gender gaps in a large group of developed and developing countries.
	Data sources
	OECD Social and Welfare Statistics and ILO.
	Indicators used to demonstrate the macroeconomic impact of gender equality
	Income and aggregate productivity.
Description of the example	**Analytical methods used**
	First of all, Cuberes and Teignier (2016) develop a theoretical model to assess the implications of gender gaps in the labour market, then simulate the effects of a complete gap, and finally estimate the income loss in OECD and non-OECD countries.
	1. The model follows the span-of-control framework of Lucas (1978). Agents have an entrepreneurial talent x, depending on which they can choose to become either firm workers, with wage w, or entrepreneurs, who earn the profits of the firm they manage. In the latter case, they can decide to be self-employed or employers. If x is smaller than the cutoff z_1 agents become workers, otherwise self-employed or employers. They become employers if x is also larger than a second cutoff z_2. The model assumes that women and men are identical, but that women face exogenous restrictions: a fraction are excluded from entrepreneurship, while among those who remain a fraction are excluded from self-employment, and a third fraction are also excluded from the labour market. The paper does not provide justification for these restrictions: they can be discrimination, difference in supply factors, or differences in optimal choices by the individual.
	Women who do not participate in the labour market produce zero output, causing an output loss, which is likely to be larger than the real one, since home production is not taken into account (thus it can be considered a ceiling). Frictions in the number of employers and of the self-employed also affect total output, by reducing the occupational cutoffs.
	2. To simulate the model, firstly the authors set the parameters: some are taken from the literature, some are set to meaningful values and some are calibrated to match the real fraction of employers and self-employed (e.g. parameters of talent distribution). The three gender gaps are country-specific. The paper presents two numerical results, in the short run and in the long run. In the short run, capital is constant, while in the long run the capital stock is negatively affected by the introduction of gender gaps.
	3. The first simulation provides the effects if (i) all women were excluded from entrepreneurship, but not from self-employment, if (ii) they were all excluded from self-employment (and entrepreneurship), and if (iii) they were also completely excluded from the labour force. With the gender gaps, the efficient allocation of talent and resources is distorted, thus there is a decline in aggregate income per worker and per capita.
	4. Finally, for each OECD country, Cuberes and Teignier (2016) compute the parameters associated with the gender gap, comparing the female and male data on labour force participation, share of employers, and shares of the self-employed population.
	5. The model is also extended to make it more suitable for developing countries, introducing the possibility of out-of-necessity self-employment (i.e. those who choose self-employment because they have no other option). There is evidence suggesting that the fraction of the self-employed is much larger in developing countries and that they often choose this occupation because there is no better alternative (Poschke, 2013). Cuberes and Teignier (2016) then use data from non-OECD countries to quantify the effects of gender gaps in developing contexts.

Section	Field
Lessons learnt	**Outcomes and results** **1. Model implications** (a) An increase in the entrepreneurship gender gap decreases the labour demand and the equilibrium wage, decreasing the cutoff z_1 and, indirectly, z_2, i.e. decreasing the talent of entrepreneurs and the self-employed. (b) An increase in the self-employment gender gap increases the labour supply, and thus decreases wages. Again, this decreases both z_1 and z_2. **2. Maximum possible effects of the gender gaps** (a) If all women were excluded from entrepreneurship (but not from self-employment), the income per capita loss would be 7.1 % in the short run and 8.6 % in the long run. (b) When all women are also excluded from self-employment, the negative effect would be 10.1 % to 11 % (respectively, in the short and long run). (c) Finally, when all women are excluded from the labour market, income per capita decreases by 46.8 % to 50 %. **3. Effects in OECD and non-OECD countries** (a) The average labour force participation gap in OECD countries is 0.22. The entrepreneurship gap is 0.43 and the self-employments gap is 0.18. (b) The average income loss due to gender gaps is 14.1 % to 15.4 % (short/long run). The income loss due to the gaps in entrepreneurship and self-employment is about 5 % to 5.7 %. Italy is the OECD country with the largest average loss (21.2 %). (c) The average total loss in non-OECD countries is 16 % to 17.5 %; however, there are large differences, depending on the region. Non-OECD European countries have an average loss of 4.8 % to 5.4 % due to entrepreneurship and self-employment gaps, and an income loss of 9.8 % to 10.8 % due to all the gender gaps taken together. Thus even if the models are slightly different (and not entirely comparable), the effects in non-OECD European countries seem even smaller than in OECD countries. It should be noted, however, that OECD countries also include non-European ones (e.g. Mexico and Turkey). The region with the largest income loss, as one might expect, is the MENA (35 % to 38 %). When merging OECD and non-OECD, an inverse-U relationship emerges between the level of development of a country and the total income loss due to gender gaps, consistent with Goldin (1990). The relationship is negative when considering income loss due only to entrepreneurship gender gaps.
	Methodological considerations and lessons for further research This paper represents a good starting point for understanding the consequences of gender inequality. However, several limits and possible extensions are worth mentioning. (a) The empirical analysis focuses on OECD and non-OECD countries. However, for the purpose of this project, it would be interesting to perform this analysis on Europe only. (b) The theoretical framework does not model the decision of agents to participate in the labour market or any differential aspect in the occupational choices of women. An interesting extension would be to introduce a household production sector in the model. (c) The paper does consider either sectoral differences in terms of female labour intensity or differences in terms of entrepreneurial talent between women and men (possibly due to gender gaps in education). (d) A further possible extension would be to include effects on human capital choices, as in Esteve-Volart (2009).

Section	Field
Lessons learnt	Drawing attention to the comparison between E3ME and the methodology employed by Cuberes and Teignier (2016), the following issues need to be mentioned. ■ A similarity between any modelling exercise which is implemented in E3ME and the present academic article is that in both cases short-run and long-run effects are modelled. ■ However, an advantage of cointegration techniques is that they provide a 'measure' of the speed of the adjustment between the short run and the long run. The cointegrating relationship is an equilibrium relationship in the sense that it seeks to capture the long-run relationship between a set of variables. However, policy interventions sometimes take time to have effect and for the economy to adjust back to its long-run position, so understanding and being able to identify the short-run adjustment process is also useful.
Sources	http://www.journals.uchicago.edu/doi/full/10.1086/683847 NB: The paper previously circulated under the titles 'Gender inequality, factor allocation, and aggregate productivity' and 'Gender gaps in the labour market and aggregate productivity'. **David Cuberes** Associate Professor Department of Economics Clark University 950 Main Street Worcester, MA 01610 Tel. (508) 793-7237 Email: dcuberes@clarku.edu https://sites.google.com/site/davcuberes/ **Marc Teignier** Assistant Professor Universitat de Barcelona, Facultat d'Economia i Empresa Avgda. Diagonal 690, 08034 Barcelona, Spain Tel. (+ 34) 934 021 989 (ext. 372341) Email: marc.teignier@ub.edu http://www.marcteignier.com/

3.3. Methodological example 3: Labour market — Participation

Section	Field
Key characteristics	**Tool**: Esteve-Volart, B. (2009), 'Gender discrimination and growth: theory and evidence from India', available online at http://bertaev.info.yorku.ca/files/2016/06/disc_january2009.pdf
	Internal identifier: Esteve-Volart (2009)
	Country covered: India
	Year of publication: 2009 (NB: not published — last available version).
	Researcher: Berta Esteve-Volart (York University, Toronto, Canada).
	Analytical methods: - theoretical model; - macroeconomic model with single equation (regression analysis).
	Gender equality areas: Labour market, leadership. **Measures**: - exclusion of women from the labour market; - exclusion of women from managerial positions.
	Time period: 1961-1991.
Eligibility in relation to selection criteria	**1. Methodological illustration** The paper dedicates a large amount of space to explaining and discussing the theoretical model, which predicts the economic impacts of gender inequality in access to managerial positions and to the labour market. The implications of the theoretical model are assessed with a panel regression on Indian states. The theoretical model follows Rosen (1982), with some differences. As an innovation, Esteve-Volart (2009) considers the implications of gender discriminations in the previous model (Rosen, 1982). The empirical model that Esteve-Volart applies as a standard is not particularly innovative, but is well established. In addition to previous research, she also considers the impact of the gender gap on human capital accumulation, and not only on macro outcomes. Moreover, to address endogeneity concerns, the author proposes instrumental variables. The example covers two gender equality areas within the field of the labour market. **2. Methodological robustness** First, the empirical results are supported by the theoretical predictions, helping in understanding the mechanism and interpreting the results. Second, the empirical model controls for variables that are known to affect the output and to reduce the risk of omitted variable bias. Other unobserved heterogeneities are addressed using country fixed effects (taking advantage of the panel dimension of the data). Finally, Esteve-Volart (2009) discusses the importance of assessing causality, and to do so she uses instrumental variables. Fixed effects regressions have already been used in this literature (e.g. Klasen, 1999; Klasen and Lamanna, 2009). On the other hand, the instrumental variable approach is commonly used to assess a causal relationship, and it has already been used to estimate a causal impact of gender equality in education on economic growth. However, Esteve-Volart is the first to propose and use an instrument for gender equality in labour market participation (ratios of women-to-men primary and middle school teachers). A pitfall is that the instrument proposed has scarce applicability in the context of developed countries, where the ratio of teachers favours women. It may also reflect job segregation by gender more than women's access to the labour market.

Section	Field
Eligibility in relation to selection criteria	**3. Learning effects** The example provides theoretical and empirical support that gender inequality in labour market participation and in access to managerial positions have a detrimental effect on economic growth, per capita GDP, and on women's education, increasing the gender gap in education. This last point is interesting, as it shows that gender gaps in the labour market and in education are highly correlated. However, a pitfall of the paper is that it does not control for gender equality in education and in other areas; it is thus potentially prone to omitted variable bias. With respect to other papers, it has the advantage of providing a theoretical example to interpret and evaluate the empirical results. A positive aspect of the example is that it also discusses — and excludes — the possibility that the positive effect on GDP arises from a simple accounting fact (e.g. women becoming visible by working in the labour market instead of at home), something that should also be taken into account by future research. Finally, it also discusses the reasons that may cause the persistence of gender discrimination. **4. Geographical representativeness** The implications of the model are tested only on India. An advantage is that the model can also be tested on different countries (e.g. European countries).
Description of the example	**Context analysis** Esteve-Volart (2009) investigates the impacts of gender discrimination in the labour market and in managerial positions on per capita GDP and human capital investment. She builds on previous literature. In particular, the model is based on a model by Rosen (1982), adding the dimension of gender (in)equality. As pointed out by the author, there are papers using models to study the link between inequality in human capital and earnings and economic growth. They investigate the interaction between labour and fertility, in a context of developing countries: reducing the gender gaps would reduce fertility and thus increase growth. In contrast, Esteve-Volart (2009) does not investigate the link via fertility, focusing on impacts beyond fertility and child rearing and providing a complementary explanation of the effects (allocation of talent). An additional advantage of the model proposed by Esteve-Volart is that it can be used to investigate the effects of other types of discrimination. **Gender inequality addressed** Esteve-Volart (2009) analyses the impacts of gender discrimination in the labour market and in access to managerial positions: exogenous social norms exclude women from certain positions or from the overall labour force. **Variable used to measure gender equality** To do so, in the empirical section the author considers the women-to-men ratios of workers and managers (a subset of workers). **Aims and objectives** The example aims at investigating if social norms that restrict women's employment have economic consequences, acting as a brake on economic development. To do so, it develops a theoretical model and tests the implications with an empirical analysis of India. **Data sources** Official estimates in India: Census of India; estimates of state domestic product; education in India; annual surveys of industries. **Indicators used to demonstrate the macroeconomic impact of gender equality** Per capita output.

Section	Field
Description of the example	**Analytical methods used** First of all, Esteve-Volart (2009) develops a theoretical model to assess the implication of gender discrimination in the labour market. She then tests the implications for India, which is a developing country where women's labour participation stands at 22 %. 1. The model follows Rosen (1982): there is an economy where each firm is run by one manager, who employs workers. In addition, in Rosen's model individuals can work in home production. Individuals are born with a given endowment of skills (managerial talent, productivity as a worker, productivity as a home worker) and can optimally choose either to become a manager or a worker. In addition, they can invest in human capital to improve their skills. If they decide to be workers, they can acquire primary education to improve their skills (and thus wage); those who become managers should acquire primary education, and can also acquire higher education (improving their profit at a certain cost). Home production does not improve with education. Managerial talent is distributed uniformly among women and men. An individual decides from managerial job, a working position, or home production (never chosen in the absence of discrimination). The decision of becoming a manager depends on talent, given that the profit obtained is a function of skills. There are three factors that determine growth: (i) the average quality of ideas (due to the entrepreneurial talent of managers — **innovation**); (ii) the average worker productivity (**adoption**); and (iii) residual factors, determined by the education of people in home production. 2. In the empirical section, Esteve-Volart (2009) tests the implication of her model for a developing country, using data from 16 Indian states (95 % of the population). To estimate the results, Esteve-Volart run a state fixed effects regression, where the dependent variable is either the log of (non-agricultural) state domestic product (impact on economic growth) or the women-to-men literacy ratio (impact on human capital). The independent variable of interest is the women-to-men ratio of non-agricultural workers and of managers. In addition, the author controls for human capital, population growth, the ratio of urban population, the ratio of capital to labour, and year fixed effects. 3. To address endogeneity issues, Esteve-Volart further estimates the results with an instrumental variable approach. She uses the ratio of women-to-men primary and middle school teachers as an instrument, which, according to the author, is a proper instrument as long as it does not directly affect per capita output. Rather, it is a proxy for the cultural values of gender roles. 4. The author also estimates the basic results (OLS) by sector, to assess the impact on the agricultural, manufacturing and tertiary sectors. 5. Finally, Esteve-Volart tests whether the results are robust to several sensitivity checks.

Section	Field
	Outcomes and results
	1. Model implications
	A prediction of the model is that a decline in wages decreases the talent of managers (the incentive to become a manager also increases for less talented ones). The implications that are of interest to us are the following.
	(a) Gender discrimination in managerial positions (partial discrimination): for developed countries, where wages tend to be high, there is no effect on education; in developing countries, with low wages, partial discrimination lowers female education. In the latter case, discrimination against women implies lower economic growth (lower education > lower productivity > lower wages > lower cutoff of talent). The consequences for economic growth in developed countries are not discussed, but it seems that there should be no effect.
	(b) Gender discrimination in the labour market (total discrimination): average female education is lower than the absence of discrimination and lower than male education (women have no incentive to invest in education). As a consequence, there is lower economic growth, due to the residual part of growth, which depends on education. There is also lower per capita GDP, since women engage in home production, which is less productive.
Lessons learnt	(c) In the context of the unitary model of the household, discrimination should not persist (total household income is lower). Discrimination may persist in a bargaining framework (e.g. Lundberg and Pollak, 1993) or in an identity approach (gender jobs associations) (Akerlof and Kranton, 2000). Another explanation is assortative mating with a comparative advantage related to men working outside the home. Finally, a possible channel is fertility, which increases women's comparative advantage in home production.
	2. Empirical results
	Gender inequality in access to labour or to managerial positions negatively affects economic development.
	(a) An increase in the ratio of women-to-men managers in one unit (from 100 % men to 50-50) would lead to a 319 % increase in per capita income (582 % with instrumental variables).
	(b) An increase in the ratio of women-to-men workers is associated with a 153 % increase in per capita income (464 % with instrumental variables).
	a) Larger effects with the instrumental variable approach suggest that in India the relationship between income and women's labour force participation may be negative: poor women engage in worker activity and the social norm is binding. Thus, endogeneity may even bias the coefficients downwards.
	b) In addition, the author confirms the effect on education: the women-to-men ratio of managers and the women-to-men ratio of workers have a positive effect on women-to-men literacy (with IV, the effect is significant).
	c) In the agricultural sector, there is no effect (men tend to have a physical advantage, thus more gender equality in the agricultural sector may not lead to better outcomes).
	d) The larger effects are found in the tertiary sector, where talent is more important than physical ability.
	The results are robust to different specifications, and the author discusses and excludes the possibility that they are simply an accounting effect.

Section	Field
	Methodological considerations and lessons for further research
	The paper by Esteve-Volart (2009) is an interesting example, as it provides both theoretical and empirical support to the findings. In addition, in the empirical section the author assesses if the effects are causal, using an instrumental variable approach.
	However, a number of drawbacks arise in terms of the purpose of this project. First, the theoretical model and the most important predictions are for developing countries. In order to extend the author's findings to developed countries, such as the EU's Member States, the implications of the model should be further discussed and analysed: most of the theoretical conclusions stem from the notion that in a situation where discrimination is present, women would invest less in education, but this is not the case in the EU. Indeed, the gender gap in education in the EU has favoured women in recent times, particularly in higher education. An appropriate model for developed countries should also account for this fact and explain the trend, in a context where there are nevertheless gender gaps in both employment and in managerial positions.
Lessons learnt	Finally, the instrument proposed (women-to-men teacher ratio) may not be appropriate in a context such as that of the EU where the number of women employed as teachers is high, in particular in primary schools. Indeed, in the EU a large number of women teachers may reflect job segregation by gender more than women's access to the labour market. However, the women-to-men ratio in different jobs, less prone to gender segregation, could also be used as an instrumental variable among developed countries.
	In terms of the comparison between E3ME and Esteve-Volart's (2009) approach, the following issues need to be considered.
	■ The cointegration technique which is used to estimate the E3ME equations is more suitable than a fixed effects regression to capture the behaviour of the economy through time. In other words, the estimation of individual behavioural equations by means of cointegration is the most appropriate technique to model the evolution of time series which are non-stationary, while fixed effects are appropriate when the cross-sectional dimension is longer than the time dimension of the sample under consideration.
	■ A fixed effects regression will be more suitable to model an equilibrium between several variables.
	■ E3ME provides results in the case of 69 industries, while Esteve-Volart (2009) distinguishes only three broad sectors, i.e. the agricultural, manufacturing and tertiary sectors.
	■ Esteve-Volart (2009) applies OLS to estimate individual models for each sector. OLS is not a suitable econometric technique if the time series under consideration has a unit root. This is the case of many economic variables which are analysed over a long period of time, e.g. 44 years of data, as considered in the case of E3ME.
Sources	http://bertaev.info.yorku.ca/files/2016/06/disc_january2009.pdf
	Berta Esteve-Volart Associate Professor Department of Economics, York University Vari Hall 1066, 4700 Keele Street Toronto, ON, M3J 1P3, Canada Tel. (416) 736-2100 Ext. 77029 Fax (416) 736-5987 Email: berta@econ.yorku.ca http://bertaev.info.yorku.ca/

3.4.   Methodological example 4: Economic decision-making — Leadership

Section	Field
Key characteristics	**Tool**: Matsa, D., Miller, A., 'A female style in corporate leadership? Evidence from quotas', *American Economic Journal: Applied Economics*, Vol. 5(3), 2013, pp. 136-169.
	Internal identifier: Matsa and Miller (2013)
	Countries covered: Norway (and Nordic area).
	Year of publication: 2013
	Researchers: David Matsa and Amalia Miller.
	Analytical methods: Micro-econometric methods (diff-in-diff; quasi-natural experiment).
	Gender equality area: Leadership and labour market **Measures**: Percentage of women in boardrooms.
	Time period: 2003-2009
Eligibility in relation to selection criteria	**Methodological illustration** This paper uses a quasi-natural experiment provided by a law imposing quotas on boardrooms of publicly listed Norwegian companies to assess the impact of women's leadership on corporate decisions. This methodology is well established in the empirical microeconomic literature. However, this paper represents one of the first examples in the literature assessing the impact of women leaders on economic outcomes. **Methodological robustness** This study broadly discusses any potential bias and concretely tries to solve it. In particular, the major problem of endogeneity is the non-random distribution of women leaders across firms. It is solved by exploiting the quasi-natural experiment provided by the Norwegian law in the context of the diff-in-diff approach. This methodological analysis is much more robust than other micro-econometric analyses, since it uses a 'clean' identification strategy, rather than more indirect methods such as the instrumental variable estimation. **Learning effects** This paper clearly shows that there is a connection between women leaders and employment outcomes. In particular, women leaders are found to undertake fewer workforce reductions than comparison firms. For the reasons set out above relating to methodological robustness, this paper can be considered as a 'best of its kind' study. The outcome variable is employment, measured in terms of number of employees at the firm level (this is a microeconomic paper). This paper does not directly deal with inclusiveness and sustainability issues. However, the results suggest that women's leadership may have effects in terms of poverty reduction. **Geographical representativeness** This paper focuses on Norway (using other Nordic firms as comparison).

Section	Field
	Context analysis
	This paper is one of a number of studies aiming at identifying the economic effects of women's leadership (e.g. women managers, CEOs and board members) in the private sector.
	Gender equality problem addressed
	This paper focuses on gender equality issues in the top echelons of firms (namely boardrooms).
	Variable used to measure gender equality
	Percentage of women board members.
	Aims and objectives
	This paper focuses on the impact of women leaders on corporate policies, with a special focus on employment policies.
	Data sources
	The paper uses a panel data set on Nordic firms covering the period from 2003 to 2009. The data set is recovered from the Bureau Van Dyik's Orbis database and covers comprehensive balance sheet information, as well as information on employment and on the composition of boardrooms.
	Indicators used to demonstrate the macroeconomic impact of gender equality
	Firms' policies (in particular, employment decisions).
Description of the example	**Analytical methods used**
	The main problem in the identification of the causal effect of interest relates to the fact that women leaders are most likely not randomly distributed across firms. In particular, the problem arises when the sorting of women leaders is somehow correlated with the nature of corporate policies carried out by the firm. A straightforward example may be represented by the firm culture. Indeed, firms that are naturally open to gender equity concerns may be more prone to employ a larger fraction of women leaders and, at the same time, may pursue employment policies that are more favourable to gender equality, or at least more focused on employees' needs.
	In order to solve this identification problem, a 'clean' strategy is to exploit some quasi-natural experiment that exogenously shifts the amount of women leaders in the firms. With that exogenous source of variation, it is possible to assess the **causal** impact of women leaders, removing all the sources of bias stemming from sorting and unobserved heterogeneity.
	This is what is done in this paper. In 2006, a law that introduced quotas (at the 40 % level) in the boardrooms of publicly listed companies was approved in Norway. The analysis compares the outcomes of 'treated' firms (publicly listed Norwegian firms) with **comparable** 'non-treated' firms (unlisted Norwegian firms and publicly listed and unlisted firms in other Nordic countries), using a classical diff-in-diff approach.
	The paper uses a panel data set on Nordic firms covering the period from 2003 to 2009. The data set is recovered from the Bureau Van Dyik's Orbis database and covers comprehensive balance sheet information, as well as information on employment and on the composition of boardrooms.

Section	Field
Lessons learnt	**Outcomes and results** This paper finds that most of the corporate decisions and outcomes were unaffected by the law. In particular, revenues and non-labour costs were substantially similar between treated and non-treated firms. However, the paper documents notable differences in the employment policies of treated firms. Indeed, firms affected by the quota undertook fewer workforce reductions compared to firms that were left unaffected. The paper estimates that this effect is large: affected firms increased their employment level by as much as 30 % more than comparable unaffected firms. This has led to increased payroll costs and, consequently, to a decrease in short-run profits. The paper estimates that, after the quota, the ratio of operating profits to assets decreased by as much as 4 % more than within firms that were not hit by the law. The paper also finds that such results are robust to a large number of different specifications and samples. Moreover, the effects on employment policies are found to be larger in firms that had to add the most women employees to comply with the law, i.e. firms that were far below the 40 % level before the law came into force. Interestingly, there is no evidence that the impact of the quota on corporate policies was due to something different from gender, such as the age and the experience of the newly hired (women) board members. Indeed, the paper finds the effect of quotas on workforce reductions to be similar for firms with older and more experienced board members after the quota compared to firms with younger and less experienced board members after the quota, suggesting that the effect found is indeed driven by gender. The interpretation of the effect is in terms of different preferences between women and men, with women being more oriented to taking care of employees' needs and, therefore, more prone to carry out labour-hoarding practices. In other words, they are more willing than men to not dismiss their employees even when it would be economically meaningful, such as when the firm is experiencing a period of economic downturn.
	Methodological considerations and lessons for future research Overall, this paper represents a solid study of the impact of women leaders on firms' decisions and shows that instating equity between women and men at the top of firms is likely to have relevant economic benefits. Panel data techniques are the methodology which has been used in the case of this microeconomic contribution. This methodology performs well in those cases where the cross-sectional dimension of the panel is longer than the time dimension. However, a similar approach would not be suitable to estimate the relevant parameters which are required to populate E3ME. In particular, 44 years of data are considered to estimate single behavioural equations in the case of each unit (e.g. sector, consumption category, population group, etc.). Another reason which prevents the use of panel data in the current study is the high degree of heterogeneity across the different countries and industrial sectors across the EU.

Section	Field
	https://www.aeaweb.org/articles.php?doi=10.1257/app.5.3.136
Sources	**David Matsa** dmatsa@kellogg.northwestern.edu David Matsa is an Associate Professor of Finance at the Kellogg School of Management at Northwestern University and a Research Associate at the National Bureau of Economics Research. Professor Matsa's research focuses on connections between business and financial strategy and emphasises the importance of labour market frictions in the corporate environment. His recent research examines optimal corporate capital structure determination, concentrating on various strategic motivations vis-à-vis the firm's workforce, and on the role of managerial preferences in firms' labour market and other strategies, including workforce hiring and downsizing decisions. **Amalia Miller** am5by@virginia.edu Amalia Miller is an Associate Professor in Economics at the University of Virginia. Her research interests include public finance, labour economics, health economics and industrial organisation. She has recently been involved in the analysis of the impact of women leaders on firms' employment policies.

3.5. Methodological example 5: Economic decision-making — Leadership

Section	Field
Key characteristics	**Tool**: Tate, G., Yang, L., 'Female leadership and gender equity: evidence from plant closure', *Journal of Financial Economics*, Vol. 117, 2015, pp. 77-97 ([43]).
	Internal identifier: Tate and Yang (2015)
	Countries covered: US
	Year of publication: 2015
	Researchers: Geoffrey Tate and Liu Yang
	Methods: Micro-econometric methods (OLS and FE estimations).
	Gender equality area: Leadership and labour market. **Measures**: Women leaders (defined as the percentage of women among the top five earners in the firm).
	Time period: 1993-2001
Eligibility in relation to selection criteria	**Methodological illustration** This paper uses micro-econometric techniques to estimate the differences in wage changes experienced by women versus men workers displaced from closing plants and the impact of women's leadership on such wage changes. The empirical methods used are largely established and traditional. **Methodological robustness** This paper broadly discusses any potential bias and concretely tries to solve it. Firstly, it uses involuntary displacement due to plant closure to address the potential endogeneity of job changes. Moreover, it controls for differences in job choices between women and men by estimating a pair fixed effects model that compares workers moving from the **same** closing plant to the **same** new firm (i.e. diff-in-diff estimation). **Learning effects** This paper clearly shows a positive connection between gender equity in leadership positions and gender equity in the (totality of the) labour market. It can be used as a 'best of its kind' study to represent such connection. The outcome variable is gender equity, measured in terms of the gender differences in wage changes experienced by workers after a plant closure (measured at the microeconomic level). This paper finds that women leaders significantly contribute to reducing wage drops associated with job losses among women workers. This, in turn, led to a more equal income distribution across gender. **Geographical representativeness** This paper focuses on the US.

Section	Field
	Context analysis
	This paper is one of a number of studies aiming at identifying the economic effects of women's leadership (e.g. women managers, CEOs and board members) in the private sector.
	Gender inequality addressed
	This paper focuses on gender equality issues in the top echelons of firms (namely, the top five earners in the firm).
	Variable used to measure gender equality
	Women leaders (defined as the percentage of women among the top five earners in the firm).
	Aims and objectives
	This research represents a micro-econometric study on the economic effects of women leaders. It explores the impact of women leaders on gender equity using evidence from the plant closure. In particular, it measures how women leaders affect wage drops experienced by women versus men workers after an involuntary job loss.
	This paper represents the first attempt to empirically assess this issue.
	Data sources
	The empirical analysis uses a worker-, firm- and plant-level data set for the US covering the 1993-2001 period. The data set used in the analysis covers 461 449 workers in 9 244 closing plants covering 23 states in the US.
Description of the example	**Indicators used to demonstrate the macroeconomic impact of gender equality**
	Wage policies of the firms.
	Analytical method used
	The paper broadly deals with the identification issues.
	In particular, the main problem is represented by the non-random distribution of jobs across gender.
	Indeed, women may tend to have jobs which are more flexible, require a lower investment in human capital accumulation, and are characterised by a lower degree of competition and risk. If these differences in job choices between women and men are somehow related to the sorting of women into leadership positions, then it is hard to assess whether women leaders **cause** reductions in the pay disparity between women and men.
	The paper takes several steps in order to solve this problem.
	Firstly, in order to deal with the endogeneity of job changes, the focus is restricted to those job changes that are involuntary, that is to say, job changes stemming from plant closure. Indeed, if women and men change jobs at different points in time and at different rates (note that women tend to have higher turnover rates compared to men), their job would change differently, thus wage changes in those cases would be difficult to interpret.
	Secondly, the paper corrects for the differences in job choices between women and men by estimating a pair fixed effects model that compares women and men who move from the **same** closing plant to the **same** new plant in the year following the plant closure. This paper thus estimates the diff-in-diff between women and men workers subjected to the same shock, that is, the plant closure followed by the same involuntary job change.

Section	Field
	Outcomes and results
	The first finding is that displaced workers experience significant wage drops in the new job (i.e. the job after the plant closure).
	The second finding is that women workers are associated with significantly larger (5 % more) wage drops than men workers.
	The third finding is that wage drops experienced by women workers are significantly smaller (by 50 %) if the hiring firm is led by a woman.
	Moreover, this result intensifies if the management team is in the great majority composed of women, suggesting that when the firm's management is entrusted to women, they can more easily enforce their decisions.
	Some ancillary findings are that the positive impact of women leaders is strongest for women in the middle of the age distribution and that it extends to women at the lowest ranks of the wage distribution.
	Lastly, this paper finds that in multi-division firms it is the gender of the corporate CEO that matters and not the gender of the manager of the plant hiring the worker. Moreover, there are no significant differences in terms of wage drops if the hiring plant is the home division of the CEO or one of the firm's other divisions. This casts light on the major role of culture as a mechanism behind the effect of women leaders, as opposed to differences in terms of local interactions between women workers and women leaders (e.g. initial wage negotiation).
Lessons learnt	Overall, this paper suggests that having women in leadership positions represents an important externality, since women leaders cultivate more gender-sensitive policies within their firms.
	Methodological considerations and lessons for future research
	In conclusion, this study represents an initial empirical attempt to assess the impact of women leaders on the wages of workers who have recently been made redundant. As highlighted above, this study deals appropriately with endogeneity issues. The novelty of the research question and the study's focus on identification are the major reasons for choosing it as a 'good practice' example. In addition, the results are interesting and significantly contribute to our understanding of the economic benefits of women's leadership.
	In terms of the comparison between E3ME and Tate and Yang (2015), some key issues are discussed, as follows.
	■ As discussed in methodological example 4, cointegration is a more suitable approach than a fixed effects regression to model the behaviour of the economy through time (see also methodological example 4 for further details).
	■ As mentioned above, Tate and Yang (2015) apply OLS to estimate individual models which supplement the fixed effects estimates. As pointed out in the case of methodological example 4, OLS is not an appropriate approach if the time series under consideration is non-stationary, i.e. I(1). Many economic variables which are analysed over a long period of time seem to be trended and non-stationary. These characteristics are present in the case of most variables which are modelled in E3ME.

Section	Field
	http://www.sciencedirect.com/science/article/pii/S0304405X1400018X
Sources	**Geoffrey Tate** Geoffrey_Tate@kenan-flagler.unc.edu Geoffrey Tate in an Associate Professor at the Kenan-Flagler Business School of the University of North Carolina at Chapel Hill. His primary research interests are in the areas of empirical corporate finance and behavioural finance. His work explores the effect of managerial biases on corporate investment and financing decisions. He also researches the composition of boards of directors and how it affects firm policies and performance. His recent work studies the interaction between labour economics and organisational structure, focusing on the implications for individual workers. **Liu Yang** lyang@rhsmith.umd.edu Liu Yang is an Assistant Professor in Finance at the Smith School of Business, University of Maryland. Her research interests include theoretical and empirical corporate finance in the areas of mergers and acquisitions, corporate restructuring, corporate governance, labour economics and financial institutions.

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About the study

The study on the 'economic benefits of gender equality' is unique in the EU context. It's the first of its kind to use a robust econometric model to estimate a broad range of macroeconomic benefits of gender equality in several broad areas such as education, labour market activity and wages.

The overall results of the study show that more gender equality would lead to:

■ Between 6.3 million and 10.5 million additional jobs in 2050 with about 70 % of these jobs taken by women
■ Positive GDP impacts that grow over time
■ An increase in GDP per capita of up to nearly 10 % in 2050

The study used the E3ME macroeconomic model to estimate the economic impacts of improvements in gender equality. E3ME is an empirical macroeconomic model tailored specifically to model outcomes at EU and Member State levels.

The outputs of the study on economic benefits of gender equality in the EU include nine publications:

1) Literature review: existing evidence on the social and economic benefits of gender equality and methodological approaches
2) EU and EU Member States overviews
3) Report on the empirical application of the model
4) How the evidence was produced: briefing paper on the theoretical framework and model
5) How the evidence was produced: factsheet on the theoretical framework and model
6) Economic impacts of gender equality in the EU policy context: briefing paper
7) Economic impacts of gender equality: briefing paper
8) How gender equality in STEM education leads to economic growth: briefing paper
9) How closing the gender labour market activity and pay gaps leads to economic growth: briefing paper

All publications, detailed study results and methodology can be found on EIGE's website: http://eige.europa.eu

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