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How Individualism Influences Female Financial Inclusion through Education: Evidence from Historical Prevalence of Infectious Diseases

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How Individualism Influences Female Financial Inclusion through Education: Evidence from Historical Prevalence of Infectious Diseases

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Abstract

We examine a novel hypothesis about the mediation role of education in the relationship between individualism and female financial inclusion. Grounded in the parasite-stress theory of values, which posits that regional variations in infectious diseases influence cultural traits such as individualism, we employ causal mediation analysis within the instrumental variables framework. We dissect the total average causal effect of the individualism-collectivism cultural dimension, as defined by Hofstede's classification index, on female financial inclusion, distinguishing between direct and indirect impacts via the education channel. We find that education significantly mediates almost half of the overall influence of individualism on female financial inclusion.

Keywords:

JEL Classification:

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1 Introduction

Formal financial systems and infrastructures reduce capital costs and facilitate the efficient allocation of productive resources, leading to economic growth, prosperity, and capital accumulation (Swamy, 2014). Policymakers and researchers are interested in understanding the drivers of financial inclusion, which refers to the accessibility, availability, and usage of the financial system by all members of an economy, including those who are poor, disadvantaged, marginalized, indigenous, and women. Financial inclusion has the potential to alleviate poverty and reduce inequality. According to Allen et al. (2016), drivers of financial inclusion include account costs, proximity to financial intermediaries, legal rights, and a stable political environment. However, they conclude that the extent of financial inclusion may vary depending on the characteristics of the individuals under consideration.

This research intends to answer how much individualistic culture affects female financial inclusion. Females are more likely to be financially excluded (Demirgüç-Kunt et al., 2013) and marginalized in ownership, access, and use of productive resources (Swamy, 2014) and weak female empowerment can adversely affect economies and societies (Duflo, 2012).

Current literature on “culturally-based explanations into economics” and “culture as a possible determinant of economic phenomena” are widely accepted (Guiso et al., 2006). Literature uses the Hofstede (2001) individualism-collectivism classification index of cultural dimension to capture a reflection of society’s understanding of self as either independent or interdependent (Davis and Williamson, 2021), which is an influential determinant of cultural difference across societies (Heine, 2015; Markus and Kitayama, 1991). Individualistic cultures have lesser societal en-roots, higher ties to themselves and their immediate family (Nikolaev et al., 2017), and value personal independence, autonomy, self-reliance, experimentation, and innovation; in contrast, collectivist societies encourage conformity and discourages individuals from standing out from the group

through a variety of restrictive social norms ([Gorodnichenko and Roland, 2012](#)).

[Davis and Williamson \(2019\)](#) argue individualistic societies value individualism and respect individual rights, which is inherent gender-egalitarian, resulting in a cultural understanding of women as autonomous agents and the moral equals of men. In contrast, collectivist values may subordinate women’s personal goals to their social obligations, generating greater acceptance of gender inequality. Following [Davis and Williamson \(2019\)](#) and [Davis and Williamson \(2021\)](#), we argue that individualism promotes the female’s financial inclusion.

[Lu et al. \(2021\)](#) quantify the impact of individualistic culture on financial inclusion, [Davis and Williamson \(2019\)](#) and [Davis and Williamson \(2021\)](#) quantify the effect of individualism on gender inequality or rights, and [Nikolaev et al. \(2017\)](#) study the impact of individualism on income inequality. Within the same line of thought, we intend to quantify the causal effect of individualism on females’ financial inclusion. However, we bring together an exciting contribution— an examination of the mechanism through which the causality flows from individualism to female financial inclusion. Limited studies discuss individualism and females’ financial inclusion, and to the best of our knowledge, no analysis exists that elaborates on the causal mechanisms.

We hypothesize that the channel of education mediates the effect of individualism on female’s financial inclusion. Although studies exist to elaborate individualism-collectivism in the context of education ([Darwish and Huber, 2003](#); [Telhaug et al., 2004](#); [Moss et al., 2007](#); [Arora et al., 2011](#)) and financial literacy ([Brown et al., 2018](#); [De Beckker et al., 2020](#); [Ahunov and Van Hove, 2020](#)), almost all studies are two-nation or two-culture comparative analysis, and none study how individualism mediates via education to affect female’s financial inclusion.

Meanwhile, any pair of relationships we intend to exhibit between individualism, education, and financial inclusion for females, of course, can be spurious correlation rather than causality, mainly due to the fact of unobserved confounders, omitted variable bias, and reverse causality. To deal with these issues, based on the Parasite-Stress Theory of

Values for the evolutionary psychology and biology literature, we use the historical prevalence of infectious disease as an instrumental variable or as a source of exogenous variation for the individualism (Davis and Williamson, 2021; Nikolaev et al., 2017; Cashdan and Steele, 2013; Murray and Schaller, 2010). Parasite-Stress Theory of Values states that regional variations of infectious diseases that humans encounter over time influence certain cultural traits, for example, xenophobia, openness, and ethnocentrism, which translates into social values associated with collectivism-individualism which then shape various socioeconomic and political outcomes at regional level (Thornhill and Fincher, 2014).

In our research, we first find individualism’s total average causal effect on female financial inclusion using an instrumental variable approach based on the two-stage least square (2SLS) method. Second, we employ causal mediation analysis within the instrumental variables regressions to decompose the total average causal effect estimated from 2SLS into direct and indirect effect (Dippel et al., 2020) for the education channel, through which individualism affects the financial inclusion of females.

2 Data and methodology

2.1 Sample for empirical analysis

We retrieve data from multiple sources to construct a sample for empirical analysis. We rely on a cross-sectional study because we need more data on our main variables of interest over time. For example, the financial inclusion measures for females are available for 2011, 2014, and 2017. In contrast, the measures of individualism are individual-level data but aggregated at the country level and available from 1981. The only overlapping year of financial inclusion with individualism data is 2014. Hence, we perform a cross-section analysis.

2.2 Individualism

We intend to quantify to what extent the concept of individualism impacts female’s financial inclusion. Hence, we define the concept of individualism as a treatment variable. While the literature has extensively used the Hofstede (2001) measure of individualism (Beugelsdijk et al., 2015; Davis and Abdurazokzoda, 2016; Gorodnichenko and Roland, 2017; Cline and Williamson, 2017; Davis and Williamson, 2019; Dutta et al., 2021), we construct the measure of individualism from World Value Survey (WVS).¹ We utilize four questions from the WVS to construct the individualism index: 1) “private ownership of business and industry should be increased vs. government ownership of business and industry should be increased,” 2) “one of my main goals in life has been to make my parents proud,” 3) “abortion is never justifiable,” and 4) “homosexuality is never justifiable.” We perform principal component analysis on these four questions to create the ‘*individualism*’ index variable and the index is then standardized. A higher value of the individualism index denotes greater individualism. Finally, we aggregate the individualism index over the available time for each country.

2.3 Female’s financial inclusion

Our outcome variable is female’s financial inclusion. The most popular data source based on the extent of data availability is World Bank’s Global Financial Inclusion Data.² We consider twelve different measures of female financial inclusion for the available years of 2011, 2014, and 2017, and then we average them over the years for our analysis. These twelve different measures of female financial inclusion aged 15 plus are the percent of females who held a bank account, used a debit card, used a credit card, used the internet to pay bills, made digital payments, saved for businesses, saved for old age, borrowed for health and medical, borrow to start a business, borrowed from financial institutions, borrowed from friends and families, and received wages in past years.

¹Accessed August 11, 2021, from <https://www.worldvaluessurvey.org/wvs.jsp>.

²Accessed August 11, 2021, from <https://datacatalog.worldbank.org/dataset/global-financial-inclusion-global-findex-database>.

Unlike [Lu et al. \(2021\)](#), who use each of these variables separately, we perform principal component analysis on these twelve different measures of female financial inclusion to develop an index. The index is the first principal component and captures nearly 86% of variation from twelve various financial inclusion measures for females. A higher value of this index denotes more eminent female financial inclusion. The female financial inclusion index has higher eigenvalue loadings, from the highest for digital payments, followed by the percentage of females who held a bank account, used a debit card, and used the internet, respectively.

2.4 Impact of individualism on female’s financial inclusion

The country-level baseline regression of female financial inclusion on individualism is a regression equation that undoubtedly suffers the estimation bias due to the unobserved confounders unknown to researchers. Hence, we set out to establish an identification strategy employing external instruments for individualism.

$$\text{female's financial inclusion}_c = \alpha_0 + \theta \text{individualism}_c + e_c \quad (1)$$

where, c index for countries.

[Nikolaev et al. \(2017\)](#) use the historical prevalence of infectious diseases, proxied with the pathogen index by World Value Survey (WVS), as an instrumental variable (IV) for individualism. Literature has shown that societies experiencing a high degree of pathogenic stress are more likely to develop traits related to ethnocentrism ([Navarrete and Fessler, 2006](#)), distrust of immigrants ([Faulkner et al., 2004](#)) and generally values that disregard the well-being of out-group members. Thus, such societies are more likely to develop collectivist attitudes ([Fincher et al., 2008](#)). Further, [Fincher et al. \(2008\)](#) suggests societies are more likely to develop traits associated with social tolerance and trust of out-groups. [Nikolaev et al. \(2017\)](#) find evidence of a strong correlation between the variables— historical prevalence of infectious diseases and individualistic values. The

exclusion restriction is that the historical prevalence of infectious disease should not affect females' financial inclusion other than its effect through the individualism-collectivism dimension of cultural values. We call this instrument *pathogen*.

We put forward the rationale that the pathogen can satisfy relevance and exclusion criteria to qualify as an instrumental variable, as the pathogen is relevant to explain individualism (relevance). Still, the pathogen is exogenous to financial inclusion (exclusion). Hence, with two-stage least square methods (2SLS), we can identify the impact of individualism on financial inclusion as following sets of two regressions.

$$\begin{aligned} individualism_c &= \alpha_1 + \beta_1 pathogen_c + \epsilon_c \\ female's\ financial\ inclusion_c &= \alpha_2 + \phi \widehat{individualism}_c + \epsilon_c \end{aligned} \tag{2}$$

where the first stage regression uses pathogen as an instrumental variable to predict individualism and the second stage regression utilizes $\widehat{individualism}_c$, the predicted value of individualism from the first-stage regression, to explain the variations in female's financial inclusion. The $\widehat{\phi}$, coefficient from equation 2, estimates individualism's total impact on female financial inclusion.

As long as the instrument (pathogen) randomizes the treatment variable, one can estimate the causal effect of the treatment (individualism) variable on the outcome variable (female's financial inclusion) without including any additional controls.³ One way to test the inherent strength or weakness of an instrumental variable is with [Staiger and Stock \(1997\)](#) F -statistic. If the F -statistics above 10, it implies the statistical plausibility that the instrument is exogenous and, therefore, a good IV for the 2SLS model ([Staiger and Stock, 1997](#)).

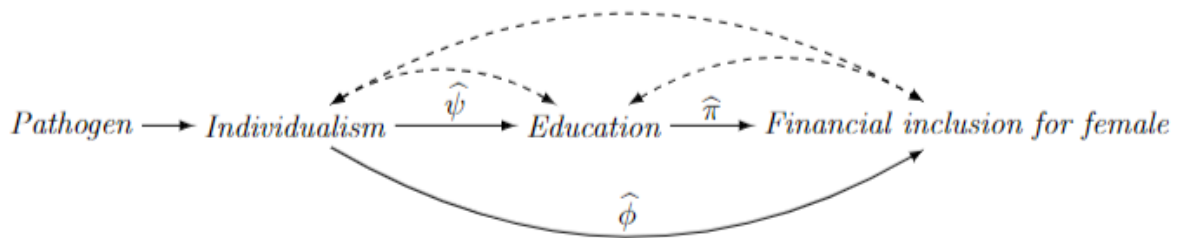
³A researcher can augment additional but the same covariates as control variables in the first and second stages of regression, and such can reduce the standard error of estimates without jeopardizing estimates. However, if a researcher includes collider variables— variables causally influenced by treatment and outcome variables— as control, such inappropriate controls trigger bias in estimation, known as collider bias. Since we do not have complete information on which observable variables are covariates, confounders, and colliders, we refrain from including further control in our regression to avoid potential biases.

2.5 Mechanisms

The $\hat{\phi}$ coefficient from equation 2 estimates the impact of individualism on female's financial inclusion. However, we prefer to understand the mechanism within such a relationship. Answering to what extent individualism affects females' financial inclusion via different means or channels would be interesting. We propose education as an independent mechanism through which individualism affects female financial inclusion.

The total effect of individualism on the female's financial inclusion, given as $\hat{\phi}$ coefficient from equation 2, may comprise two different effects. First is the direct impact of individualism on financial inclusion, and second is the indirect effect of individualism on financial inclusion mediated through the proposed channel. However, identifying such direct and indirect impacts requires additional attention as several unobservable factors confound the relationship between individualism and channels of mechanism and between a channel of mechanism and female financial inclusion. Such relationships can be exhibited in the following directed acyclic graph (DAG). For illustration purposes, we consider education as a mechanism that mediates individualism's effect on female financial inclusion.

Figure 1: Directed acyclic graph (DAG)



Directed acyclic graphs (DAGs) are used in economics to model causal relationships between variables. DAGs are a graphical tool that can help researchers visually represent and better understand some key economic concepts, such as causation, confounding, and bias (Imbens, 2020). DAGs present all the paths from a causal variable to an outcome, including the role of any intermediate variables.

Following the rationale from equation 2 that pathogen can satisfy relevance and exclusion criteria to qualify as an instrumental variable for individualism, we can identify the causal effect of individualism on education (a mechanism), as $\hat{\phi}$, from another set of 2SLS regression.

$$\begin{aligned} individualism_c &= \alpha_1 + \beta_1 pathogen_c + \mu_c \\ education_c &= \alpha_3 + \psi \widehat{individualism}_c + \nu_c \end{aligned} \tag{3}$$

where, coefficient from equation 2 estimates impact of individualism to female's financial inclusion.

Next is to estimate the effect of a mediator (education) on the outcome (female's financial inclusion). Undoubtedly, education is systematically non-random; therefore, it needs to be instrumented by a separate instrumental variable (Jun et al., 2016; Frölich and Huber, 2017). However, recent work of Dippel et al. (2020) offers a solution using a single instrumental variable to estimate the causal effect of a mediator on an outcome without assuming away endogeneity. They utilize the same instrumental variable for treatment and mediator variable. However, their solution requires performing separate 2SLS regression to estimate the effect of a mediator (education) on the outcome (financial inclusion for females) conditioning on treatment (individualism), where the mediator (education) is instrumented with the same instrumental variable for treatment variable (pathogen).

$$\begin{aligned} education_c &= \alpha_4 + \beta_2 pathogen_c + \gamma_1 individualism_c + \epsilon_c \\ female's\ financial\ inclusion_c &= \alpha_5 + \pi \widehat{education}_c + \omega individualism_c + \epsilon_c \end{aligned} \tag{4}$$

Coefficient $\hat{\phi}$ from equation 2 is the total effect; $\hat{\omega}$ coefficient from equation 4 is the direct effect of individualism on female's financial inclusion.

The difference between $\hat{\phi}$ and $\hat{\psi}$ is an indirect effect or average causal mediation effect, which will be equivalent to an interaction of impact of individualism on education or $\hat{\psi}$ from equation 2 and effect of education on financial inclusion of female or $\hat{\pi}$ from equation 3.

$$\underbrace{\hat{\phi}}_{\text{Total effect}} = \left(\underbrace{\hat{\omega}}_{\text{Direct effect}} + \underbrace{\hat{\psi} \times \hat{\pi}}_{\text{Indirect effect}} \right)$$

3 Results

Table 1 presents the summary statistics. The data comprises 90 unique country and their respective values of *female's financial inclusion*, *pathogen*, *education*, and *individualism* for the year 2014.

Table 1: Summary statistics

Variables	Min	Mean	Median	Max	SD	Source
Pathogen	-1.31	0.03	0.10	1.16	0.62	Thornhill and Fincher (2014)
Education	1.18	1.95	1.96	2.53	0.32	World Bank
Individualism	-0.74	0.00	-0.05	1.51	0.50	World Value Survey (WVS)
Female's financial inclusion	-0.15	0.00	-0.02	0.22	0.11	World Bank's Global Financial Inclusion Data

Notes: Numbers of observation is 90. Observations are based on 90 different countries of the world.

Table 2 exhibits the estimates from the regression equation 1, 2, 3, and 4. Column (1) exhibits the estimates for equation 1, which is an un-adjusted correlation of individualism and females' financial inclusions.

We can see from the equation 2 that columns (2) and (3) of Table 2 represent the first and second-stage regression, respectively. These regressions allow us to estimate individualism's *total effect* on female financial inclusions, using pathogen as an instrumental variable. The first-stage regression, consistent with the literature, shows a negative correlation between pathogens and individualism. The F -statistics for this regression is 93.215, above 10 (Stock and Yogo, 2005), indicating that the instrument pathogen is relevant in predicting treatment variable individualism (Staiger and Stock, 1997). Pathogen is likely a strong instrument, given that it is exogenous to female's financial inclusion, which is

Table 2: Effect of individualism on female's financial inclusion via education

	<i>female's financial inclusion</i>		<i>female's financial inclusion</i>		<i>female's financial inclusion</i>	
	<i>individualism</i>	<i>education</i>	<i>education</i>	<i>education</i>	<i>education</i>	<i>education</i>
	<i>Naive</i>	<i>IV First-stage</i>	<i>IV Second-stage</i>	<i>IV Second-stage</i>	<i>IV First-stage</i>	<i>IV Second-stage</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<i>individualism</i>	$\hat{\theta} = 0.164^{***}$ (0.012)				$\hat{\gamma}_1 = 0.035$ (0.076)	$\hat{\omega} = 0.103^{***}$ (0.018)
<i>pathogen</i>		$\hat{\beta}_1 = -0.592^{***}$ (0.061)			$\hat{\beta}_2 = -0.343^{***}$ (0.059)	
<i>individualism</i>			$\hat{\phi} = 0.210^{***}$ (0.020)	$\hat{\psi} = 0.614^{***}$ (0.088)		
<i>education</i>						$\hat{\pi} = 0.175^{***}$ (0.044)
<i>Intercept</i>	$\hat{\alpha}_0 = -0.003$ (0.008)	$\hat{\alpha}_1 = 0.026$ (0.040)	$\hat{\alpha}_2 = -0.003$ (0.008)	$\hat{\alpha}_3 = 1.914^{***}$ (0.034)	$\hat{\alpha}_4 = 1.929^{***}$ (0.025)	$\hat{\alpha}_5 = -0.338^{***}$ (0.085)
Wald F-stat		93.215***			17.376***	
Observations	80	80	80	80	80	80
R ²	0.620	0.541	0.570	0.134	0.542	0.687
Adjusted R ²	0.615	0.535	0.564	0.123	0.530	0.679

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are robust to heteroskedasticity and clustered by country. $\hat{\phi}$, $\hat{\omega}$ estimates the total and direct effect of individualism on female's financial inclusion. The interaction $\hat{\phi}$ and $\hat{\psi}$ yields individualism's indirect effect on female financial inclusion via the education channel.

plausible. Based on the predicted value of individualism, the second stage shows that individualism promotes female financial inclusion, and the estimate is $\hat{\phi} = 0.210$ and statistically significant at a 1% significance level.

Table 2 also shows the estimates for equation 3, allowing us to estimate individualism's total effect on education, using pathogen as an instrumental variable. Therefore, the first-stage regression of equation 2 and 3 are the same and put in column (2), while the second-stage regression for equation 3 is presented in column (4) and shows an estimate of $\hat{\psi} = 0.614$ and statistically significant at 1% level of significance.

Table 1 shows that pathogen, individualism, female financial inclusions, and education are standardized z -scores. While Table 2 columns (3) and (4) respectively show that individualism's *total effect* on female financial inclusions is $\hat{\phi} = 0.210$ while individualism's total effect on education is $\hat{\psi} = 0.614$, almost three-times more prevalent. Hence, we intend to examine to what extent education affects female financial inclusions using

equation 4 and Table 2 columns (5) and (6) provide the mediation analysis.

We remain careful in this mediation analysis because the causal pathways have several reverse causalities. For example (Telhaug et al., 2004) examine how education affects individualism considering case studies of Scandinavian countries, the Social Democratic parties' impact on education has been significant, and that the trend up to now is towards deregulation, decentralization, and individualization. Another example is Jiang et al. (2022), where they find that COVID-19 spreads much faster in more individualistic societies than in more collectivistic societies. They examine the pathways from individualism to pathogens proxied by the spread of COVID-19.

To block these reverse causal pathways, we implement the recent work of Dippel et al. (2020) that uses a single instrumental variable to estimate the causal effect of a mediator on an outcome without assuming away endogeneity. They utilize the same instrumental variable for treatment and mediator variable. However, their solution requires performing separate 2SLS regression to estimate the effect of a mediator (education) on the outcome (financial inclusion for females) conditioning on treatment (individualism), where the mediator (education) is instrumented with the same instrumental variable for treatment variable (pathogen). The equation 4 estimates are presented in the Table 2 column (5) and (6). These columns provide the mediation analysis.

We consider pathogens an instrumental variable in predicting education while controlling for individualism in the first stage. The F -statistics is 17.376, above 10 (Stock and Yogo, 2005). In the second stage, we regress female financial inclusions on the predicted education, where we can find two relevant estimates. First is the direct effect of individualism on the female financial inclusions given as $\hat{\omega} = 0.103$, which is statistically significant at a 1% significance level. The ratio of direct effect to the total effect of individualism on the female financial inclusions is $\frac{0.103}{0.210} \times 100 = 49\%$. Second is one of the partial effects of education on the female financial inclusions after controlling individualism given as $\hat{\pi} = 0.175$, which is statistically significant at a 1% significance level. The interaction of $\hat{\psi} = 0.614$ and $\hat{\pi} = 0.175$ given as $\hat{\psi} \times \hat{\pi} = 0.614 \times 0.175 = 0.108$ is the

effect of individualism on female financial inclusions mediated via education. The ratio of indirect effect to the total effect of individualism on the female financial inclusions is $\frac{0.108}{0.210} \times 100 = 51\%$.

One major issue with the indirect effect of the total impact of individualism on female financial inclusion is the lack of *report* of the statistical significance. For this, we implement [Dippel et al. \(2020\)](#) and present the entire results along with standard errors in [Table 3](#). The [Dippel et al. \(2020\)](#) simulation exhibits that the effect of individualism on female financial inclusions mediated via education given as $\hat{\psi} \times \hat{\pi} = 0.614 \times 0.175 = 0.108$ is statistically significant at a 1% level of significance.

Table 3: Total, direct, and indirect effects

Variables	Coefficient	SE	z	p -value	Ratio
Total effect: $(\hat{\phi})$	0.21	0.02	10.13	0.00	
Direct effect: $(\hat{\omega})$	0.10	0.02	5.11	0.00	0.49
Indirect effect: $(\hat{\psi} \times \hat{\pi})$	0.11	0.03	3.37	0.00	0.51

Notes: Instrumental variable: *pathogen*, Treatment variable: *individualism*, Mediator variable: *education*, Outcome variable: *female financial inclusion*. F-statistic for excluded instruments in: based on first-stage treatment on an instrument: 93.851, and based on first-stage mediator on an instrument controlled with treatment: 37.16. Note that [Dippel et al. \(2020\)](#) estimates the indirect effect and F -statistics based on simulation; the F -statistics reported in [Table 2](#) in column (5) are different than [Dippel et al. \(2020\)](#) estimates of simulated F -statistics.

4 Conclusion

We disaggregate the impact of individualistic culture on female financial inclusion and found roughly 49% accounts for the direct impact of individualistic culture on female financial inclusion, and 51% accounts for the indirect impact of individualistic culture on female financial inclusion mediated via education channel. Our results reconcile two strands of literature. The first literature examines the impact of individualistic culture on financial inclusion ([Lu et al., 2021](#)). Second literature that quantifies the effect of individualism on gender inequality or right ([Nikolaev et al., 2017](#); [Davis and Williamson, 2021](#)). As our results exhibit that 51% accounts for the total impact of individualistic culture on female financial inclusion mediated via education channel, one major takeaway

from our parasite-stress theory of values grounded empirical analysis is that, rather than target financial inclusion directly, policy should, therefore focus its attention on education. Results from (Telhaug et al., 2004) support our claim as they examine how education affects individualism considering case studies of Scandinavian countries, and found that the Social Democratic parties' impact on education has been significant and that the trend up to now is towards deregulation, decentralization, and individualization.

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