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Article

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Macroeconomic cost of excluding persons with disabilities from the workforce in Spain

Abstract

The article analyzes and deals with the problems associated to exclusion of persons with disabilities from the workforce based on the impact it has in the context of economic and social dimensions, considering the fact that it results in high cost because of such exclusion. Specifically, it estimates the macroeconomic cost to the Spanish economy by modeling the incorporation of this collective into the job market. Varying types of inclusion are proposed, which are defined in terms of the different barriers that this collective encounters when attempting to access the job market. In this article, these barriers are divided between those that result from a labor gap and those that result from an education gap. The study then quantifies the macroeconomic benefits resulting from an increased participation of persons with disabilities in the workforce.

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1 Introduction

Over the last few decades, the exclusion of persons with disabilities from the workforce has been acknowledged as a social problem. Consequently, within the varying disciplines involved in understanding this phenomenon, a serious effort has been made to learn its causes and effects. Thus, governments and international entities have tried different ways to deal with it using both active and passive policies aimed at integrating such persons into the workforce. The associated economic dimension of the problem along with other perspectives give credence to new arguments in formulating policies in favor disabilities persons so that the policies support workforce inclusion, based on the fact that estimates of the economic costs of workforce exclusion to different countries have been high. According to estimates provided by the International Labour Organization (ILO) (2002), the cost of such exclusion varies between 3% and 7% of any given country's GDP.

Based on the compelling nature of the problem as outlined above, the main goal of this article is to provide estimates of the macroeconomic costs caused by excluding persons with disabilities from the workforce in Spain and to quantify, using different macroeconomic variables and the impact of the incorporation of this collective would have on the job market. For this, we started with a diagnosis of the status of disabled persons in the workforce from the Continuous Sample of Working Lives (in Spanish, Muestra Continua de Vidas Laborales [MCVL]), and then proposed different scenarios of workforce integration to assess their potential impact. The main goal is to present the potential benefits associated with the increased workforce participation of disabled persons and to provide a reference point for political discussion.

Active measures to support the integration of persons with disabilities into the workforce in Spain have been developed to promote such integration within the regular job system, to improve integration within a system of protected work, or to shift workers from protected jobs to regular jobs (Hernández and Millán, 2015).

There has been extensive debate over this collective's modes of entry and participation in the workforce, mainly as it is related to the existence of protected markets (in Spain, Sheltered Employment Centers or SEC) and the gamble on integration within the regular or ordinary job market, with actions that favor the transition from regulated markets into normal ones being especially notable, given that such transitions are quite rare in reality and that SEC serve as "shelter-job" especially during times of economic crisis (Rodríguez, 2012).

Regardless of the kinds of measures implemented, the main goal of such integration policies is to minimize the barriers encountered by persons with disabilities in the job market, which result in low rates of activity and employment (Albarrán-Lozano and Alonso-González, 2010; Greve, 2009; Jones, 2006; Malo and Muñoz-Bullón, 2006; Rodríguez, 2012; Silva and Vall-Castelló, 2017) and comprise one the greatest challenges faced by the collective.

This article does not attempt to evaluate different instruments or integration policies. But, rather, it identifies the basic situation of the Spanish job market and offer varying scenarios with differing levels of integration, including complete integration indistinguishable from that of persons without disabilities and measures the kind of impact the policies associated with each scenario would have at the macroeconomic level. Thus, this research can be considered as an instrument of diagnosis and ex-ante assessment, for the formulation of

employment policies directed at integration of people with disabilities. Its main elements, which add value to these policies, can be summarized in two aspects: the creation of counterfactual scenarios and the particularization of employment deficits by activity sectors, which allow the formulation of labor policies with instruments and they can be adapted to the peculiarities of each sector.

For this, it uses a non-traditional version of an input-output table (the Ghosh model) which is modified to make gross value added and consumption endogenous. Contrary to to the more-common Leontief model which is used to examine demand shocks, the Ghosh model is used to examine the impact of the input shock based on the inclusion of additional workers with disabilities to the available workforce. This methodology is able to estimate a more complete set of effects than others, because it can simulate indirect and induced benefits from expanding employment and equalizing wages.

The study begins with a literature review that has been previously carried out at the international level aimed at estimating the macroeconomic costs of excluding disabled persons from the workforce. Then, the details of methodology employed in the analysis are presented, and further describes the situation experienced by disabled persons within the workforce in Spain, offering different scenarios that converge toward the full integration of persons with disabilities into the workforce. This article ends with a description of the principal results obtained with conclusions.

2 Review of the literature

This section outlines key research carried out at the international level to estimate the macroeconomic costs of excluding person with disabilities from the workforce. Based on this, it presents a literature review that provides models and estimates determining the macroeconomic losses due to the exclusion of disabled persons at the national level in various countries and at the global level. This research covers a wide spectrum ranging from simple calculations of macroeconomic losses that use a single factor, such as the unemployment rate, as a reference point, to more complex models, which not only calculate loss of productivity in GDP percentage points but also measure the economic impact using models that depend on an input-output framework. Unlike other quantitative evaluative impact models—experimental, regression, temporal series models, etc.—this article uses a multisector input-output model, which has the ability to reflect the impact on both the economic sector directly affected by any given policy and the other economic sectors being studied. The results determining a value-threshold are methodologically challenging and argumentative to start political, social, and economics debate of exclusion/inclusion of people with disabilities in the labor market.

In Canada, the Roeher Institute carries out a study in 1993 that estimated the direct and indirect costs associated with illnesses (Rioux, 1998; Moore et al., 1997). The indirect costs are quantified based on human capital and estimated the value of the loss of productivity associated with disability, both in the long and short term. This estimation methodology is used most often in cost-benefit and cost-effectivity analyses.

The World Bank (Metts, 2000) published one of its first reports measuring the costs of exclusion because of disability at the global level, using a bottom-up approach. Extrapolating

from the results of the Canadian case study, it was estimated that the total annual loss of world GDP resulting from disability was between 1.37 and 1.94 billion U.S. dollars. The technique used by the author is a variation of the approach developed by the Roeher Institute for Canada. It assumes that losses to GDP due to disability are a positive function of the incidence of the exclusion of persons with disabilities, given that excluded people do not contribute to overall productivity, and that such losses are an inverse function of overall unemployment, since a higher unemployment rate suggests less participation (rates of activity) of persons with disabilities in the job market.

Based on the results of the World Bank's research, new methodologies and techniques were created to improve estimates of the costs of workforce exclusion and carry out comparative analyses in a wide range of countries. The model developed by the ILO (Buckup, 2009) followed suggestions made by the World Health Organization in its International Classification of Functioning, Disability, and Health and accordingly bases its estimates on barriers to participation and on limitations affecting the activity of persons with disabilities.. Further, it takes into account the link between participation and labor productivity; the availability of job market figures, not only the unemployment rate but also those on activity and employment; and data about the average productivity per inhabitant in each country.

Deloitte Access Economics (2011) proposes a model for Australia with the goal of reducing the gap between the rates of participation and unemployment for persons with and without disabilities by one third. The authors consider that this is an achievable and indeed even conservative goal by estimates.

The aim is to increase the rates of participation of persons with disabilities from 54% to 64% and reduce the rate of unemployment from 7.8% to 6.9%. The study doesn´t search the policies and programs necessary to achieve these results, neither the costs associated with increased labor participation. Its aim is to present the potential benefits associated with greater participation of persons with disabilities in the workforce and to offer a reference point for political debate.

As far as the situation in the United States, Smits (2004) reviews the progress made in public policy, national infrastructure, and support services for persons with disabilities who are seeking employment. It addresses the unresolved problems faced by persons with disabilities and demands their greater participation in helping both to solve existing problems and improve services by identifying and promoting better practices.

Previous review focuses on macroeconomic studies, which is similar to the aim of this paper. We must remember, however, that the inclusion of people with disabilities in the labor market has important effects at microeconomic level, both on workers and their families levels, on employers and firms and so on. As an example, Morgon and Polack (2014) presents some economic gains of including them in work and employment: (1) Relation to individual earnings (and household incomes): exclusion from employment of people with disabilities may lead to lower household incomes due to the lack of employment of people with disabilities, and their caregivers may forgo work opportunities to assist theirs; (2) Relation to employers and firms: there is good evidence that inclusion of people with disabilities is a smart business decision: with the proper job matching and the right accommodations, employees with disabilities can be just as productive as other workers and their inclusion may even increase overall profit margins.

Several companies have found that employees with disabilities have greater retention rates, higher attendance, and better safety records than those without a disability (Australian Chamber of Commerce and Industry, 2012). Although costs for accommodations may be additionally incurred, the savings from the reduced need for recruitment, hiring, training, lower absenteeism, and decreased insurance pay-outs, more than offset initial expenses. Additionally, inclusion of people with disabilities can improve diversity, skills, and the general work environment (International Labour Organization, 2010).

3 Methodology

In order to adapt the present analysis to the characteristics of the phenomenon being studied—and considering the information profile available based on aggregated statistical information—this article draws upon an input-output model due to its great explanatory power with respect to the goals pursued here. The input-output models, because of their capacity to describe, explain, and analyze the economy, have become a key tool for economic analysis. Furthermore, systems of national accounting are now developed and generalized in most economies, which is allowing us to obtain basic, highly valuable information about the economic situation of any given country or region.

Using this methodology, we analyze the economic impact in the varying scenarios proposed by multisector modeling, using the input-output tables (IOT) published by the National Institute of Statistics. Since shock is considered as an increase in the number of persons with disabilities entering the job market, we do not use a demand model (the Leontief model), but rather draw upon a supply model (the Ghosh model). The latter is used to model the changes to the primary input and hence well-suited to model the increases in employment (and its sectoral distribution) that are brought about by the distinct integration scenarios that are proposed here.

The construction of the input-output tables, with equal sums in both rows and columns, allows the introduction of an alternate model to the Leontief or demand model (Lahr and Dietzenbacher, 2001; Miller and Blair, 2009), in which the coefficients are determined horizontally (distribution coefficients) instead of vertically (technical coefficients). In this alternate model, the exogenous variable is the value added rather than the final demand. This supply or Ghosh model (Ghosh, 1958) is obtained by means of a new matrix called a distribution matrix, which is calculated using the relations of the IOT in columns.

Its matrix is expressed by the following equation:

$$x^t = x^t B + w \text{ or, } x^t = w \cdot (I - B)^{-1} \tag{1}$$

where x^t responds to the total output obtained vertically of dimension $1 \times n$, B is the matrix of coefficients of the distribution of dimension $n \times n$ and w are the primary inputs of dimension $1 \times n$. The coefficients of distribution b_{ij} are calculated in the following way:

$$b_{ij} = \frac{x_{ij}}{X_i} \text{ where } X_i \text{ represents the output of } i\text{-th branch.} \tag{2}$$

Each coefficient shows the proportion of resources in monetary terms, using the branch of the i-th row, which goes to each of the other branches or to the final demand.

In this same way, the value obtained by adding the rows of the inverse matrix of distribution coefficients will reveal the contribution made by each branch so that the primary inputs increase in unison. Because this reason, it is known as a supply multiplier.

Thus, the sum in the columns of distribution coefficients indicates change in the quantity of production due to a variation in a unit (primary inputs) in the supply of each of the branches that make up the TIO.

This way of approaching makes the model to consider that the primary inputs (the labor or capital employed in the production of the *j*-th branch) are the exogenous variables rather than the final demand just similar to the case in matrices of technical coefficients.

This model, called the Ghosh open model, does not completely capture the effects of changes to the primary inputs upon the gross value added (GVA), because of which it is necessary to enact a closure of the model (Guerra and Sancho, 2011). Since the increases in production are also reflected in the gross value added, both private consumption and the GVA are endogenized. In this way, increases in household consumption due to the increase in the remuneration of employees are taken into account by this model.

Such endogenization is performed in the following way:

We define coefficient λ_i as the added value per unit of aggregated consumption. This coefficient expresses, in normalized terms, the contribution of value added in each sector *i* necessary per unit of private consumption.

$\lambda_i = \frac{v_i}{C}$, where v_i is the value added of branch *i* and *C* is the total consumption of the private agents.

We also define coefficient d_j as the coefficient of the distribution of total consumption of good *j* by private agents.

$d_j = \frac{c_j}{x_j}$, where c_j is the private consumption in branch *j* while x_j is the production in branch *j*.

If $\lambda^t = (\lambda_1\ \lambda_2 \ldots \lambda_n)$ and $d^t = (d_1\ d_2 \ldots d_n)$ matrix $\lambda \cdot d^t$ reflects the coefficients of the distribution of value added resulting from private consumption. By including this matrix in the model, we obtain this equation:

$$x^t = t \cdot (I - B - d \cdot \lambda^t)^{-1}, \text{where } t = w - v \tag{3}$$

This inverse matrix incorporates the coefficients of the distribution of flows of materials (*B*) and flows of value added ($d \cdot \lambda^t$) and allows us to obtain the induced effects of changes in the primary inputs.

Once the impact on the total output $x^t()$ resulting from modifications in primary inputs is obtained, this impact on production will in turn cause an impact on employment in all the activity branches. Further, the vector of employment coefficients is calculated by branch (employment per unit of production) to obtain the impact on employment (*EMP*), and is diagonalized to include it in the matrix equation of the model:

$$EMP^t = w \cdot (I - B)^{-1} \cdot diag\left(E_i / x_i\right) \tag{4}$$

provides us with the *indirect* impact in employment.

$$EMP^t = t \cdot (I - B - d \cdot \lambda^t)^{-1} \cdot diag\left(E_i / x_i\right) \tag{5}$$

provides us with the *induced* impact on employment.

Similarly, the impacts on production do have effects on the gross value added (GVA) of the different branches of activity and these effects permit us to obtain impact at other macromagnitudes, such as the GDP. The calculation is performed in the same way, using the coefficients of the GVA (GVA per unit of production).

$$VAB^t = w \cdot (I - B)^{-1} \cdot diag\left(VAB_i / x_i\right) \tag{6}$$

provides us with the *indirect* impact on the GVA.

$$VAB^t = t \cdot (I - B - d \cdot \lambda^t)^{-1} \cdot diag\left(VAB_i / x_i\right) \tag{7}$$

provides us with the *induced* impact on the GVA.

4 The employment situation of persons with disabilities

The two types of databases in Spain allow us to obtain information about disability and employment: specific databases for the study of the disabilities which is referred in some section as the labor market and generic bases on the labor market that incorporate information related to disability (Rodríguez, 2013). Regarding the latter, author reviews the European Union Household Panel which is replaced by the Living Conditions Survey from 2004; the Module on People with Disabilities and their Relationship with the Labor Market, from the Economically Active Population Survey (EAPS) for the second quarter of 2002; the Module on Health Problems and their Relationship with Employment of the EAPS 2011; and the statistics on the Employment of People with Disabilities (EPD), resulting from the joint exploitation of the EAPS and the State Base of People with Disabilities.

In all cases, except EPD, classification as a person with disability is based on the self-perception of the respondent. The annual EPD classifies a person with disability if he/she has a Certificate of Disability issued by a recognized body with the particular degree of disability. This survey has the limitation of not having the data regarding associated wages of people with disabilities. This paper suggests using continuous sample of working lives (MCVL) as a source of information, since it allows examining various aspects of the employment of people with disabilities, especially related to working conditions and career paths, including wages and other economic benefits.

This section presents a description about the participation of persons with disabilities in the Spanish job market through the MCVL. This database consists of a representative sample obtained through a process of simple random sampling without stratification (1.1 million people, representing 4%) of the registered population in the Social Security System over the sampling year. The MCVL is representative of the population registered in the Social Security System during the reference year. The sample includes workers, pension earners, and recipients of unemployment benefits. In our case, data extraction took place on March 31, 2015. Data were compiled about 1,113,729 people who are registered in the Social Security System in 2014.

We divide this database in two subsamples: workers with and without disabilities. For this study, we have identified a subsample consisting of workers with disabilities, which means that these workers had communicated (to their company) that they had a degree of disability of 33% or over during at least once at work. It is necessary that workers should have a Certificate of Disability[1]. This first subsample contains personal, job, and firm´s characteristics of 5,697 workers with disabilities. The second subsample contains the rest of the database. For

1 Our identification differs from other articles that classify people with disabilities as those people who receive disability benefits (temporary or permanent, fully or partial) (Cervini-Plá et al., 2016; Silva and Vall-Castelló, 2017). Our subsample includes disabled people without disability benefits.

comparing subsample of people with and without disabilities, random sample of the second subsample with the same size of the first subsample is selected.

A descriptive analysis of workers with and without disabilities is presented below. The distributions of both subsamples provide information about the situations of persons with and without disabilities provides a base upon which different scenarios are constructed involving the improved integration of persons with disabilities into the workforce, right up to their full integration, so that it would be indistinguishable from persons without disabilities.

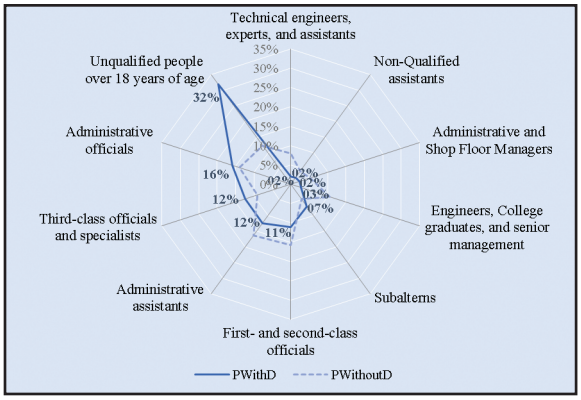
The distribution of employment for persons with disabilities shows strong sectoral segregation. Two sectors generate 40% of the overall employment: healthcare activities and social services (21.4%) and administrative and support service activities (17.7%). Contrarily to this data, these two branches represent only 14.3% of the employment of persons with disabilities. Other branches that contribute significantly to the creation of employment for persons with disabilities are industry (13% of the total), business (11.8%), other services (5.5%), public administration (4.5%), and transport and storage (4.3%).

When analyzing this type of employment, it is worth noting that 94.4% of persons with disabilities are employed by others and only 5.6% are self-employed, which is contrast to 20.6% of persons without disabilities. Therefore, the access of persons with disabilities to entrepreneurship is very limited.

Similarly, there is a strong occupational segregation. The occupational structure of employment is classified based on the different Social Security contribution groups, different of International Standard Classification of Occupation (Graphic 1). Persons with disabilities are strongly concentrated in three categories: unqualified people over 18 years of age (32%), administrative officials (15.8%), and third-class officials and specialists (12.4%). On the other hand, the collective is underrepresented in high and medium-high professional categories except the administrative group.

From the graph, it should be noted based on the context of working conditions and with job stability that permanent contracts account for about 80% (80.8% of employed persons with disabilities and 77.7% in the control group). So, the level of temporary employment (19.2%) for persons with disabilities is slightly lower than persons without disabilities. Likewise, it must be said that most job contracts for persons with disabilities (57.1% between

Graphic 1 Distribution of workers with and without disabilities by occupational group in Social Security. Percentage of the total of each sample.



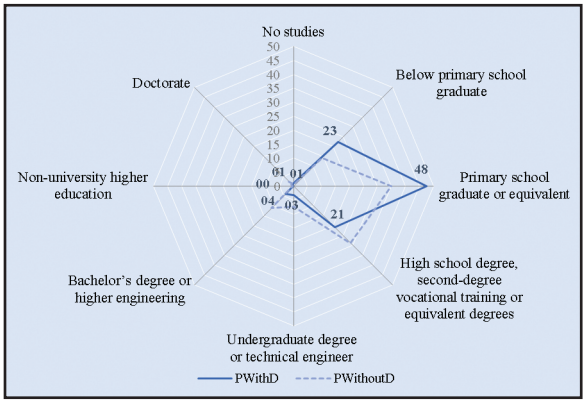
Source: MCVL (2014) and the authors.

indefinite and temporary) are not specific (with benefits to employers), but they are regular contracts.

It is worth to indicate the differences in the ways the access to the job market is determined by levels of education among persons with disabilities (Graphic 2). In fact, lower average education levels are one of the specific features inherently related to employment of persons with disabilities. Although the percentage of these who can neither read nor write is very less (only 1%), the most notable differences observed when compared with the collective of employees without disabilities are in the levels of educational qualifications: 22.5% compared to 14.3% of persons without disabilities in lower than primary school graduate and 47.6% compared to 36.5% in high school graduation rates or their equivalent Similarly, only 8.0% have undergraduate or postgraduate degrees (21.3% for persons without disabilities).

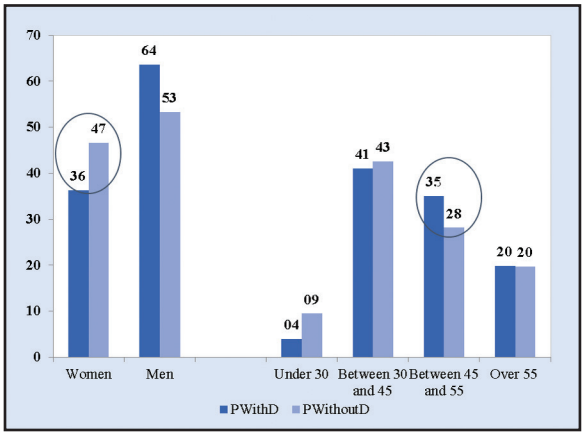
When analyzing the the demographic characteristics of employed persons with disabilities, Graphic 3 shows a higher degree of aging, which means much lower presence of people under 30 years of age and the relatively high presence of people between 45 and 54. Moreover, there is a high degree of masculinization: 63.6% of employed persons with disabilities turn out to be men (compared to 53.4% among people with disabilities).

Graphic 2 Distribution of workers with and without disabilities by education level. Percentage of the total of each sample.



Source: MCVL (2014) and the authors.

Graphic 3 Distribution of workers with and without disabilities. 2015 by sex and age range. Percentage of the total of each sample.



Source: MCVL (2014) and the authors.

5 Proposed scenarios

In order to estimate the macroeconomic impact because of inclusion of persons with disabilities on the workforce in Spain, different scenarios are proposed that converge toward the full integration of the collective up to the point that the workforce situation of people with disabilities equals that of those without disabilities. It begins from the basic foundation that an integration scenario cannot contain only one quantitative dimension (a figure indicating how jobs must be created) but rather must take into account the correction or rectification of inequalities and biases resulting from the specific sectoral distribution of the employment of the collective and the role that differential educational attainment plays therein. This correction alone will provoke a more rapid convergence of the collective's employment and will foment job opportunities whose impact will be more wide-ranging with respect to duties and workplace conditions.

We simulate a set of scenarios representing the integration of additional disabled persons into the workforce and the elimination of labor and educational gap. Further, we use the official employment rate of people with and without disabilities provided by the Spanish National Statistics Institute survey, Employment of People with Disabilities (EPD[2]), and the sectoral distribution of the MCVL subsamples to design the scenarios.

The first scenario (zero exclusion or full integration) assumes that employment rate of working persons with disabilities is increased from 25.7% to 58.2%, so that it equals the employment rate for persons without disabilities and its distribution by economic sectors. A second scenario simulates the integration of disabled persons so that the employment rate is increased from 25.7% to 39.6%. This figure represents the employment rate of persons without disability who have the same education level than persons with disability (without labor gap) and its distribution sectorial. The difference between first and second scenarios shows the integration of disabled persons without educational gap, and thus, its associated costs.

5.1 Scenario of full integration or zero exclusion

A first scenario is hereby proposed in which the current situation is compared with the scenario that would result from the elimination of differences or factors affecting persons with disabilities related to their participation and position in the job market. The scenario with no exclusion proposes that obstacles faced by the collective in their itineraries toward workforce integration are identical, in type and degree to those faced by people without disabilities. Therefore, the complete elimination of obstacles is not at all an issue, but rather the differential incidence of those obstacles as far as people with disabilities are concerned. In other words, contextual factors (high rates of unemployment, the performance of the Spanish job market, the gender wage gap, etc.) in this scenario do not disappear but instead affect people with and without disabilities in similar ways. We can assume like Gannon and Munley (2009) that people with non-severe disabilities will have similar productivity to people without disabilities. Thus, in this first scenario, the employment rate of people with disabilities increases from the current 25.7% to 58.2%, to reach the same level of the people without disabilities (Table 1).

The elimination of sectoral segregation allows the contribution of each branch to job creation for persons with and without disabilities in the same proportion. That is, the contribution

2 Our classification of workers with disabilities used by MCVL is the same that provide EPD.

of each branch to job creation for people with disabilities is proportional to their size and to their overall capacity to create employment. Achieving this elimination means strong job creation in those branches that significantly contribute to overall employment and that have not yet achieved an equivalent contribution to the employment of person with disabilities (Table 2). Thus, the Commerce branch should create around 106,000 new jobs for people with disabilities; Industry, around 48,000; the Hospitality industry, around 42,600; Public administration, over 34,000; and both Education along with Professional and technical services, around 32,000. Similarly, the two sectors in which the largest numbers of job positions are currently available for people with disabilities, namely Healthcare Services and Administrative and support service activities show reductions, but contribute to a more homogenous distribution across the different branches of activity. These jobs are counted as Full time equivalent jobs (FTE).

Table 1 Current situation of people with disabilities in the labor market and basic figures referring to the Scenario with no exclusion, 2014

	Current scenario	Scenario of full integration	Difference between the two scenarios
Persons with disabilities (from 16 to 64 years of age)	1,335,100	1,335,100	
Employment rate (%)	25.7	58.2	32.5
Employed persons	343, 294	783,427	440,132

Source: EPD (2014) and the authors.

Table 2 Current distribution of employment among persons with disabilities by branch of activity in the scenario without exclusion

	Current scenario	Scenario of full integration	Difference between the two scenarios	Difference (FTE)
Agriculture, husbandry, forestry and fishing	4,147	28,177	24,030	23,117
Extractive and manufacturing industries	44,703	92,909	48,206	46,905
Energy, water, and waste management	4,452	8,328	3,876	3,721
Construction	8,904	44,693	35,789	34,733
Commerce	40,434	146,714	106,280	96,874
Transport and storage	14,698	40,003	25,306	24,293
Hospitality industry	13,539	56,194	42,655	37,088
Information and communications	6,952	21,836	14,883	14,355
Financial activities, insurance, and real estate	5,062	25,734	20,672	19,690
Professional, scientific and technical activities	10,978	42,996	32,018	30,081
Administrative and support service activities	60,682	50,875	−9,807	−8,355
Public administration and compulsory Social Security	15,613	49,770	34,157	33,218
Education	9,453	41,678	32,225	28,890
Healthcare activities and social services	73,611	66,914	−6,697	−6,121
Artistic and entertainment activities	5,733	12,220	6,487	5,543
Other services	18,784	24,944	6,160	5,556
Households as employers	5,550	29,441	23,891	17,417
Total	343,294	783,427	440,132	407,006

Source: EPD (2014), MCVL (2014), and the authors.

Table 3 Remuneration of employees in the new jobs created in the transition with respect to the scenario with no exclusion (millions of euros)

	Remuneration of employees	Wages and earnings	Social contributions
Agriculture, husbandry, forestry, and fishing	150.78	132.82	17.95
Extractive and manufacturing industries	1,535.26	1.217.34	317.92
Energy, water, and waste management	183.21	140.58	42.63
Construction	1,081.99	853.44	228.55
Commerce	2,178.91	1,711.45	467.46
Transport and storage	774.87	608.74	166.13
Hospitality industry	938.65	811.03	127.62
Information and communications	706.51	559.80	146.71
Financial activities, insurance. and real estate	920.85	697.97	222.88
Professional. scientific and technical activities	907.84	716.12	191.73
Administrative and support service activities	−183.80	−139.94	−43.86
Public administration and compulsory Social Security	1,231.32	946.56	284.75
Education	1,196.94	929.07	267.87
Healthcare activities and social services	−248.81	−200.07	−48.74
Artistic and entertainment activities	144.39	115.03	29.37
Other services	77.46	62.47	14.98
Households as employers	404.21	361.33	42.87
Total	12,000.57	9,523.73	2,476.84

Source: EPD (2014), MCVL (2014) and the authors.

The elimination in each branch related to occupational segregation and discrimination also leads to the disappearance of the wage gap associated with disability and the equalization of average salaries[3] for people with and without disabilities in each branch of activity. Based on this premise, the creation of jobs in the different sectors would generate an increase in the remuneration of employees to the order of 12,000 million euros (Table 3). Of this amount, 9,524 million would be the wages and salaries of new jobs held by people with disabilities, which represent new wage income received by the collective; and 2,477 million would end up as social contributions, also improving the situation of the collective in terms of its present and future earned benefits.

5.2 **Scenario without labor gap**

The differences experienced by persons with disabilities that are observed in the job market have explanatory factors and they are grouped under two broad concepts: the education gap and the labor gap. The education gap refers to the variations observed among persons with disabilities in formal education due to the persistent barriers they face in the level of education. The labor gap encompasses specific differences at work affecting them when compared to persons without disabilities with similar education levels, such as sectoral segregation, occupational segregation, and wage discrimination.

3 To value the impact on remuneration of employees, we choose two subsamples with full-time jobs of the previous subsamples. This choice of workers allows a more homogeneous comparison between samples. The administrative data fix the size of subsample: 3,183 people with disabilities. Database of salaries, including monetary payments and payments in kind, comes from the Common Tax System, therefore does not contain information about Basque Country or Navarre. This geographic limitation and the type of contract decrease the size of subsamples of salaries.

Based on these determining factors, a second scenario is proposed which help us to calculate the macroeconomic cost of the labor gap affecting persons with disabilities. According to this proposal, the current scenario is compared with a scenario in which the main observable differences involving the participation of persons without disabilities with the same education levels are eliminated[4] (Table 4). Since the two groups have similar education levels, these differences cannot be attributed to education but instead can be linked with elements integral to the labor field, such as factors associated with cultural obstacles linked to disability; to job discrimination itself; or the actions of employers along with intermediate structures in the job market.

The elimination of sectoral segregation would entail persons with disabilities to work in the all sectors as persons without disabilities at the same education level, which will lead to increased job creation in those branches characterized by the most unequal contributions by both groups (Table 5). Thus, the Commerce branch should create around 68,500 new jobs for persons with disabilities; the Hospitality industry, around 32,400; Industry, around 28,000; and Public administration, 11,000. As pointed out in the previous scenario, the adjustment of sectoral structures would entail a reduction in employment for persons with disabilities in the two sectors in which their presence in most heavily concentrated.

The elimination of occupational segregation and discrimination from each branch would cause the labor gap associated with disability to disappear, which means the average salaries of persons with disabilities and persons without disabilities will become equalized. Thus, the estimated creation of new jobs would generate an increase of 4,235 million euros in employee remuneration (Table 6). Of that amount, 3,418 million would generated by wages and earnings of new jobs held by persons with disabilities and 817 would end up as social contributions.

In addition to the labor gap, which was just quantified, the education gap is also an important factor in explaining the differences observed in the job market with respect to persons with disabilities. Educational qualification is key to individual decisions regarding participation in the job market and further it determines access to given jobs, and hence affects the workplace conditions experienced by employees. Therefore, although education level is a priori, a variable that is exogenous to the job market, it has a decisive influence on employment. It is thus important to note to what degree the lower levels of professionalization among persons with disabilities impede their full workforce inclusion. The scenario with no education gap is

Table 4 Current situation of people with disabilities in the labor market and basic figures referring to the Scenario with no labor gap, 2014

	Current scenario	Scenario with no labor gap	Difference between the two scenarios
Persons with disabilities (from 16 to 64 years of age)	335,100	1,335,100	
Employment rate (%)	25.7	39.6	13.9
Employed persons	343,294	528,600	185,306

Source: EPD (2014) and the authors.

4 The employment rate for the scenario with no labor gap is the same as people without disabilities with the same level of education (mean) as disabled people.

Table 5 Current distribution of persons with disabilities in branches of activity and distribution referring to the Scenario with no labor gap

	Current scenario	Scenario with no labor gap	Difference between the two scenarios	Difference (FTE)
Agriculture, husbandry, forestry, and fishing	4,147	24,148	20,001	19,960
Extractive and manufacturing industries	44,703	72,839	28,136	26,860
Energy, water, and waste management	4,452	6,604	2,152	1,959
Construction	8,904	32,033	23,129	22,311
Commerce	40,434	109,209	68,775	61,885
Transport and storage	14,698	31,146	16,449	15,746
Hospitality Industry	13,539	45,931	32,392	27,318
Information and communications	6,952	11,039	4,087	3,831
Energy, water, and waste management	5,062	12,813	7,751	7,513
Professional, scientific, and technical activities	10,978	16,953	5,975	5,420
Administrative and support service activities	60,682	36,764	−23,917	−18,435
Public administration and compulsory Social Security	15,613	26,612	11,000	10,511
Education	9,453	17,347	7,894	6,257
Healthcare activities and social services	73,611	35,680	−37,931	−32,901
Artistic and entertainment activities	5,733	6,801	1,068	867
Other services	18,784	18,333	−451	−407
Households as employers	5,550	24,345	18,796	18,529
Total	343,294	528,600	185,306	177,224

Source: The author.

Table 6 Employee remuneration from new jobs created in the scenario with no labor gap (millions of euros**)**

	Employee remuneration	Wages and earnings	Social contributions
Agriculture, husbandry, forestry, and fishing	124.79	109.93	14.86
Extractive and manufacturing industries	776.58	615.77	160.82
Energy, water, and waste management	87.70	67.30	20.41
Construction	611.89	482.64	129.25
Commerce	1,211.25	951.38	259.86
Transport and storage	444.74	349.38	95.35
Hospitality industry	690.49	596.61	93.88
Information and communications	187.51	148.57	38.94
Energy, water, and waste management	351.36	266.31	85.04
Professional, scientific, and technical activities	153.79	121.31	32.48
Administrative and support service activities	−357.46	−272.16	−85.30
Public Administration and compulsory Social Security	350.18	269.20	80.98
Education	245.19	190.32	54.87
Healthcare activities and social services	−1,089.21	-875.86	−213.36
Artistic and entertainment activities	21.53	17.15	4.38
Other services	−5.49	−4.43	−1.06
Households as employers	430.02	384.41	45.61
Total	4,234.86	3,417.85	817.01

Source: EPD (2014), MCVL (2014) and the authors.

obtained from the difference between the scenario with no exclusion and the scenario with no labor gap. In other words, if all inequalities between the collectives of persons with and without disabilities are eliminated, existing remaining differences are attributed to differences in education levels.

When analyzing the difference between the two scenarios proposed above, it must be stressed that lower education levels among persons with disabilities are currently impeding the workforce integration of around 250,000 people. In fact, the employment rate would increase by 18.6 percentage points from the education perspective, thereby reducing the unemployment rate. Considering these results, the education gap explains around 58% of the observed differences in employment rates between persons with and without disabilities as well as the latter's exclusion from the workforce.

6 Results of the modeling

As the distinct scenarios have been proposed, their socioeconomic impact will be analyzed by multisector modeling. The database was constructed according to the Input-Output Tables for the year 2010 in Spain published by the National Institute of Statistics, and this database consisting of the salary and labor market data used in the model.

Input-output tables are the result of the solid statistical progress carried out by the different institutions to build updated tables. Since we carry out medium-term analyzes, we consider the assumption structural permanence as valid one.

The macroeconomic impact has been calculated by aggregating three kinds of effect or impacts.

Direct impact: The effect generated by the incorporation of persons with disabilities into the distinct sectors of society. The increase corresponds to a rise in wages and earnings, benefits, and taxes linked to the new jobs.

Indirect impact: This refers to the positive effects caused by the rise in intermediate demand, that is, by the demand that sectors that have grown with the direct impact make to other economic sectors (that are their providers). This is also known as the "industrial effect."

Induced effect: This refers to the positive effect on the economy of increased consumption caused by a rise in household disposable income due to the creation of new jobs. This is also known as the "consumption effect."

The first scenario proposed is the scenario of full integration in which there is neither a labor nor a wage gap, results in the following macroeconomic results.

Job creation linked to the full integration of persons with disabilities in the job market is estimated to stand at 710,184 FTE jobs (Table 7). Among these, 407,006 reflect direct impact, which means the jobs would be held by persons with disabilities, 193,038 would be generated as a consequence of the indirect effect, and another 11,141 would be due to induced effect, which is related to the increase in consumption associated with job creation. The jobs linked to indirect or induced effects would be held by the general population (both by people with and without disabilities).

The cost of current workforce exclusion stands at 39,312 million euros annually in terms of GDP, or 4% of the GDP. Of that, 23,757 million euros correspond to direct impact, which is related to activity that would have generated the workforce by including persons with

Table 7 Macroeconomic impact of the full workforce integration of persons with disabilities, 2015

	Direct impact	Indirect impact	Induced impact	Total impact
Jobs (FTE)	407,006	193,038	110,141	710,184
Wages in earnings (M €)	9,524	4,587	2,613	16,724
Contributions (M €)	2,477	1,182	687	4,346
GDP (M €)	23,757	9,529	6,026	39,312
Increase in the GDP (%)	2.4	1.0	0.6	4.0

Source: EPD (2014), MCVL (2014), and the authors.

Table 8 Impact on sectoral employment associated with the full integration of persons with disabilities in the workforce, 2015

Branches of Activity	Direct	Indirect	Induced
Commerce	96,874	45,702	19,818
Extractive and manufacturing industries	46,905	12,526	13,076
Hospitality industry	37,088	13,871	7,256
Construction	34,733	16,399	9,788
Public Administration, defense, and compulsory Social Security	33,218	20,573	7,199
Professional, scientific and technical activities	30,081	13,111	6,948
Education	28,890	23,533	6,991
Transport and storage	24,293	10,816	5,973
Agriculture, husbandry, forestry, and fishing	23,117	3,872	4,146
Financial activities, insurance, and real estate	19,690	3,527	3,649
Households as employers	17,417	17,417	2,683
Information and communications	14,355	4,845	2,593
Other services	5,556	3,010	2,888
Artistic, recreational, and entertainment activities	5,543	3,426	2,878
Energy, water, and waste management	3,721	1,159	1,156
Healthcare activities and social services	−6,121	−741	7,151
Administrative and support service activities	−8,355	−9	5,947
Total	407,006	193,038	110,141

Source: EPD (2014), MCVL (2014), and the authors.

disabilities. The indirect impact stands at another 9,529 million euros. Lastly, the induced impact, which has been already been pointed out, has its origin in the increase in household consumption of newly employed people, stands at around 6,000 million euros.

The rise in wages and earnings caused by full integration is estimated at 16,724 million euros annually. Of that, 9,524 are from the direct effect which means that they are received by persons with disabilities. The income from the indirect impact (4,587 million euros) and the induced impact (2,613 million euros) would be generated generally by both workers (with and without disabilities).

Considering the fiscal impact of full integration, the impact on social contributions is estimated at 4,346 million euros. A summary of these results are in the following table.

Notable differences can be observed between the impacts upon different sectors (Table 8). Commerce, Industry, the Hospitality Industry, and Construction are the sectors that receive the greatest impact globally. The impacts of indirect and induced effects are found to be significant in the sector of Commerce.

Since the labor gap is eliminated in the second scenario, variations in levels of education among persons with disabilities are not considered but the correction of all inequalities specific to disability are observed in the job market (lower rates of activity, sectoral segregation, occupational segregation, etc.).

As in the earlier case, this scenario relies on persons with disabilities to behave at work in the same way as persons without disabilities when the education levels are same. The results obtained are summarized and presented macroeconomically below.

The elimination of the labor gap for persons with disabilities leads to the creation of 293,669 FTE jobs (Table 9). Of those, 177,224 are due to the direct impact, that is, they would be held by persons with disabilities; 71,654 are generated from the indirect effect and another 44,791 from the induced impact.

The rise in wages and earnings caused by the elimination of the labor gap is estimated at 5,962 million euros. Of those, 3,418 would be earned by persons with disabilities. Generally, the revenue from the indirect impact (1,484 million euros) and the induced impact

Table 9 Macroeconomic impact of the elimination of the labor gap for persons with disabilities and increases in the current levels of the distinct variables, 2015

	Direct Impact	Indirect impact	Induced impact	Total impact
Jobs (FTE)	177,224	71,654	44,791	293,669
Waged and earnings (M €)	3,418	1,484	1,060	5,962
Contributions (M €)	817	337	278	1,432
GDP (M €)	9,188	3,199	2,458	14,845
Increase in the GDP (%)	0.9	0.3	0.2	1.5

Source: EPD (2014), MCVL (2014), and the authors.

Table 10 Impact on sectoral employment of the elimination of the labor gap for persons with disabilities, 2015

Branches of Activity	Direct	Indirect	Induced
Commerce	61,885	22,826	8,193
Hospitality industry	27,318	9,038	3,108
Extractive and manufacturing industries	26,860	5,801	5,720
Construction	22,311	8,241	4,088
Agriculture, husbandry, forestry, and fishing	19,960	2,532	1,906
Households as employers	18,529	18,529	1,116
Transport and storage	15,746	5,585	2,550
Public administration, defense, and compulsory Social Security	10,511	5,847	2,874
Financial activities, insurance, and real estate	7,513	1,292	1,503
Education	6,257	4.934	2.811
Professional, scientific and technical activities	5,420	2,597	2,705
Information and communications	3,831	1,320	1,008
Energy, water, and waste management	1,959	485	482
Artistic, recreational, and entertainment activities	867	735	1,157
Other services	−407	343	1,125
Administrative and support service activities	−18,435	−4,576	1,825
Healthcare activities and social services	−32,901	−13,876	2,619
Total	177,224	71,654	44,791

Source: EPD (2014), MCVL (2014), and the authors.

(1,060 million euros) would go the workers. When the fiscal impact is considered, the effect on social contributions is estimated at 1,432 million euros. These results are summarized in the following table.

Notable differences can be observed between the impacts on the different sectors (Table 10), and the most impacted sectors globally are commerce, the hospitality, and industry.

7 Conclusions and policy considerations

Although the economic costs to society due to the exclusion of persons with disabilities from the workforce has been a subject of interest at the international level for more than two decades, macroeconomic estimates of the same are scarce and, moreover, many literature that do exist have generated very restrictive hypotheses which would have influenced their results to a large degree. Nevertheless, among the most recent and notable study that have been carried out using the model and designed for this purpose was provided by the ILO must be highlighted. Similarly, some estimates of the economic impact of certain programs implemented in Australia incorporate a more complete vision of the cost, based on the fact that they not only measure the direct impact but also the indirect and induced impacts of the same.

The model proposed in this article provides two important differential elements with respect to the ILO. The first one relies on an input-output model, which allows a broader estimation of the cost since it calculates it by considering not only the direct effects of integration but also the indirect and induced effects of the same. The second is that the definition of integration provided here not only includes the creation of new job but also progressive advances in rectifying the current inequalities cited above.

This paper can be considered as an instrument of diagnosis and ex-ante assessment for the design of labor policies targeted at people with disabilities through two elements: creation of counterfactual scenarios and particularization of employment by activity sectors.

Regarding the creation of counterfactual scenarios, the elaboration of different scenarios allows quantify and obtain specific objectives that can be incorporated in the design, monitoring, and assessment of policies, setting guide lines toward the total integration of this group. The results of the assessment quantification in the zero-exclusion scenario can be taken as reference for the long-term objectives, and also allow delimit different policy instruments according to estimates of their expected revenues and expenses.

In the first scenario, the cost of the excluding persons with disabilities from the workforce is estimated by comparing the current situation to the situation once all the factors affecting persons with disabilities were eliminated. This hypothetical scenario with no exclusion does not therefore include the complete elimination of obstacles faced by persons with disabilities with respect to their access to employment but rather the incidental differentials they experience. Obviously, eliminating the labor and, above all, the education gap of the collective of persons with disabilities surely requires time. Therefore, the scenario of full integration could only be achieved in the long term.

A second scenario is proposed that does not involve variations between levels of education among persons with disabilities but rather the correction of specific imbalances (lower rates of activity, sectoral segregation, occupational segregation, etc.). This scenario with no labor gap depends on persons with disabilities performing at work similar to person without disabilities

at same education level. Since it does not include modifications of education level, it could be considered medium term.

Figures estimated in this intermediate scenario, where labor gap doesn´t exist, can set limits in terms of short and medium-term objectives. As our research shows, it is necessary to have labor policies that enhance the educational level of people with disabilities in order to achieve integration of this group. This point has already indicated by other researches (Castro et al., 2020; Sevak et al., 2015) and it is essential to reach medium term objectives.

Comparing these two scenarios allows us to quantify the significance of the education gap to the labor exclusion of persons with disabilities. Regarding the estimates carried out in the two previous scenarios, it must be stressed that the education gap in the collective is currently impeding the inclusion of around 255,000 people into the workforce. In fact, the rate of employment would increase by 18.6% solely due to the positive effect of education on the rate of activity and the negative one on unemployment. Therefore, the education gap explains around 58% reduction in the employment rate of persons with disabilities when compared to persons without disabilities.

Another contribution of this paper is related to the particularization of employment by activity sectors. This research highlights employment problems faced by people with disabilities in some sectors, which will help to formulate employment policies with instruments suitable to the peculiarities of each sector ranging from training for employment to establishment of quotas or hiring bonuses. This particularization of employment policies by activity sectors can be favored by the collaboration of social agents, whose organizational structure has a strong sectoral component in Spain.

The inclusion of the details related to activity sectors is a contribution to the literature, which has traditionally analyzed the labor integration policies of people with disabilities in the country without considering and determining the effect due to sectors. A work in which different instruments of labor policies are analyzed at a general level for Spain was performed by Silva and Vall-Castelló (2017: 29), ant this study estimated the impact of policies such as the reduction of the percentage of the regulatory base received by partially employed disabled unemployed individuals, the increase of deductions to Social Security contributions paid by employer, or the increase of tax deductions for disabled workers, among others.

Finally, the identification of sectors with higher employment deficiency of people with disabilities includes service sectors where people interact with customers and in public places, helps to formulate policies to achieve greater social awareness, a cultural change, progress of people with disabilities, and their integration into society. This reflection agrees with the work by Santero et al. (2016), which analyses the main enablers and obstacles in the integration of workers with disabilities in the Spanish Social Economy based on a qualitative analysis.

We recognize some limitations of the assumptions of the methodology that could bias the estimated costs of eliminating disability discrimination. First, we assume that wages of new workers with disabilities integrated in the labor market are equal to workers without disabilities by sector, occupation, educational level, and so on. This assumption has two implications namely there is no wage discrimination and the productivity of both groups is the same. Literature review shows no conclusive results regarding both implications.

Labor market discrimination exists only when group of workers "with equal productivity" receives different pay on average (Baldwin and Johnson, 2006; Gannon and Munley, 2009)

and shows that people with non-severe disabilities will have similar productivity to people without disabilities. Several authors find no pay gaps for disabled people who are not work-limited (Jones and Sloane, 2010) or when it takes into account the number of days of sickness leave and whether the impairment affects the amount or type of work someone can do (Longhi et al., 2012).

Other assumption is that persons with disabilities can be reallocated proportionately among sectors without incurring additional training costs. Newly employed workers and those moved to other sectors will have less experience and on-the-job training than counterpart incumbent employees, and workers who are reallocated to different sectors will lose any earnings associated with sector-specific human capital. Also, physical and communication barriers in the workplace can impede individuals with disabilities to obtain a job or reach their maximum potential once hired. Though these challenges can be overcome with appropriate accommodations—often at low or no cost—employers may not implement the necessary adjustments due to incorrect overestimation of costs, lack of information, or genuinely limited resources (World Health Organization, 2011).

When these assumptions are considered, we may think that the results may be overestimated, but we categorically believe that the results obtained provide a maximum threshold for discussing social and labor policies objectively (Morgon and Polack, 2014).

Declarations

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