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Low-Skill Offshoring: Labor Market Policies and Welfare Effects



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Low-Skill Offshoring: Labor Market Policies and Welfare Effects*

Pablo Agnese† and Jana Hromcová‡

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Abstract

We analyze the effects of low-skill workers offshoring on the welfare of the economy. In the context of a matching model with different possible equilibria, we discuss two policies that could potentially outweigh the negative welfare effects of offshoring, namely, an increase of the unemployment benefits and the flexibilization of the labor market. Our results suggest that, while both policy instruments can theoretically bring the economy back to previous welfare levels, careful thought should be given to the practicability of either measure. In particular, it would take a major increase of the unemployment benefits but only a small reduction in the vacancy cost to compensate for the negative welfare effects of offshoring. In addition, we also find that the compensation can be achieved by an upgrading of the low-skill workers that varies with the equilibria.

Keywords: Offshoring, Welfare, Unemployment benefits, Labor Market Flexibility, Upgrading.

JEL classification: F66, J68.

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1 Introduction

Critics of offshoring are mainly concerned with the welfare effects that these business practices can have on the population at large, but especially on low-skill low-wage workers. Active measures are usually called forth to palliate these negative effects of globalization, but sometimes the remedy might turn out to be worse than the disease. This paper analyzes the welfare implications of the offshoring of low-skill activities, while discussing different usual counter measures with diverging results. We evaluate two particular policies that could potentially outweigh the effects of offshoring, namely, an increase of the unemployment benefits and a reduction of the vacancy costs (broadly understood here as the flexibilization of the labor market).

The policies we have chosen for discussion have been proposed on both sides of the political spectrum, and as with every other policy measure, they have been clumsily tailored for political advantage only to deal with difficulties in a short time horizon. It is in this light that we aim at suggesting possible policy outcomes, while giving a word of warning which calls for discretion in coping with the offshoring 'threat'.

Notice that, in focusing on the effects of offshoring and its immediate political reaction, we are emphasizing the interactions between trade and labor market policies for a hypothetical equilibrium. As will become clear later, our framework cannot deal with the well-known welfare improving effects of offshoring, as some possibilities have to be left out of this preliminary study—e.g. the future recycling of low-skill workers and their increase in productivity levels. However, and in addition to our policy analysis, we allow for an exogenous upgrading of low-skill workers that works as a supplementary compensating mechanism.[1]

We build on the previous literature on matching models like Albrecht and Vroman (2002), Rogerson et al. (2005), and Davidson et al. (2008). Albrecht and Vroman (2002) propose a matching model with endogenous skill requirements where employers create both high and low-skill vacancies and where the distribution of skill requirements across theses vacancies is endogenous. It is also assumed that a low-skill job can be done by either type of worker whereas high-skill jobs can only be done by high-skill workers. Unemployment is generated by frictions and the meeting process (undirected) is taken from Diamond (1982), Mortensen (1982), and Pissarides (2000), while the wage setting approach is of the Nash bargaining type. Low-skill workers are better off the greater the fraction of low-skill vacancies, and the opposite is true for high-skill workers. Likewise, firms with low-skill requirements are better off the greater the fraction of low-skill job candidates.

[1] Endogenizing such mechanism is left for future research. For an interesting and intense debate on the welfare implications of offshoring see the Samuelson-Bhagwati exchange (Samuelson, 2004, and Bhagwati et al., 2004).

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We adapt the model in Albrecht and Vroman (2002) to our case of low-skill offshoring and then use different parameter combinations that render interesting comparative statics which can be used for policy recommendation analysis. Two equilibria are discussed: the equilibrium with cross-skill matching (CSM) and the equilibrium with ex post segmentation (EPS). CSM occurs when high-skill workers and low-skill vacancies are matched, whereas EPS takes place when these potential matches do not meet (e.g. high-skill workers only work in high-skill jobs). Changing the model's parameters yields three scenarios: (i) a change from a CSM equilibrium to another; (ii) a switch from a CSM to an EPS equilibrium; and (iii) a change from an EPS equilibrium to another. These different scenarios, in combination with the policy measures, will produce different welfare effects.

The offshoring literature has seen a recent surge in welfare analysis. For example, Mitra and Ranjan (2013) suggest that a reduction in the cost of offshoring increases offshoring and the unemployment of unskilled workers, but has a positive effect on skilled workers in the form of higher wages and lower unemployment. Ranjan (2013a) argues that some employment protection policies can play an important role in protecting workers against external shocks like offshoring. He concludes that offshoring can reduce welfare even in the presence of optimal severance payments, and that some additional redistribution program might be needed to ensure welfare gains. He also points out that employment protection in the form of administrative cost of firing fails to protect workers as it unambiguously reduces welfare. On the same line, Ranjan (2013b) suggests that when unemployment arises due to both job destruction and matching frictions, a combination of severance payments and unemployment benefits is a better policy to shield workers from offshoring than either of them alone. Jung and Mercenier (2014), in turn, analytically derive the conditions under which all workers, including low-skill, might gain from the surge of offshoring. Their main policy implication is that government action should aim at reducing market rigidities, rather than thwarting adjustment, something that calls, for instance, for extensive and flexible re-training programs.

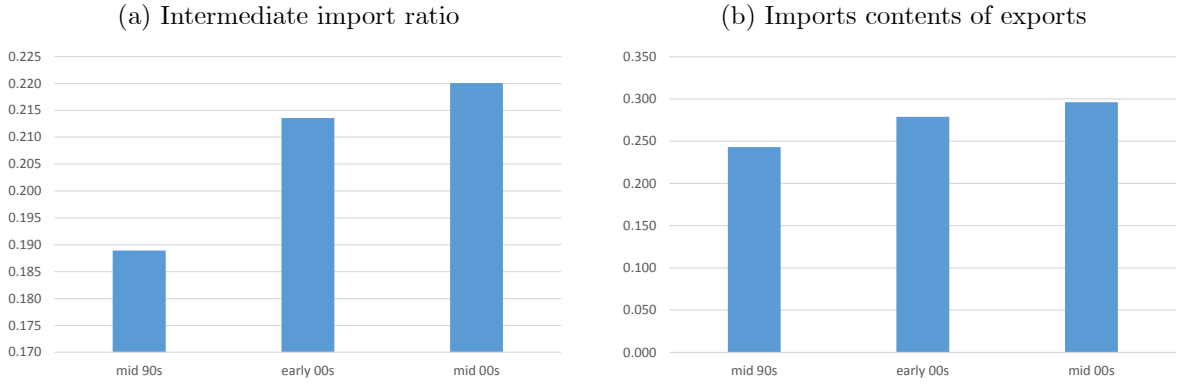
Before laying out the model in full, in the next few paragraphs we show the trends of offshoring worldwide. However, offshoring indicators are not easy to come by. Since Feenstra and Hanson (1996) original contribution little has been done in that direction, as the endeavor can prove sometimes difficult or even impossible. Indirect indicators, in turn, seem to be the second-best alternative. Trade indices as those shown in Figure 1 for 22 OECD countries display a clear upward trend of these business practices.[2] Arguably, the higher the volume of intermediate trade, as represented, for example,

[2]These countries, for which data were available for a considerable number of years, are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, UK, and US.

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by the intermediate imports or the imports contents of exports (segments a and b in Figure 1, respectively), the higher the offshoring intensity. The rationale, not devoid of criticism, goes as follows: as soon as 'relocated' business units start operating from abroad, the intensity of intrafirm trade, which mostly consists of parts, components, and other inputs previously produced in the home country, will grow substantially. Firms are thus responding to import competition from low-wage countries by moving their non-skill intensive activities to foreign locations from which they can later import back. Both indicators in Figure 1 are consistent with the story of increasing offshoring strategies worldwide. On the down side, however, they are consistent too with growing integration and interdependency of economies across the globe; in other words, higher ratios do not necessarily always mean higher offshoring intensity.

Figure 1: Offshoring trends, 5-year world averages



Source: OECD STAN Input-Output Database (2012).

Notes: (a) is intermediate imports in intermediate demand, and (b) is the degree of vertical specialization.

Figure 2 provides evidence on the involvement of the two major economic sectors, manufacturing and services. The indices there are broken down as to account for the level of offshoring intensity coming from both sectors. For manufacturing, the more traditional sector, offshoring strategies are still relatively much more significant, as these firms started their relocation activities much earlier; services firms, instead, are only recently beginning to show more interest. In fact, most of the offshoring taking place worldwide nowadays still includes highly repetitive low-skill occupations largely to be found in the manufacturing sector.[3] Moreover, beyond what is seen in the data firm theory holds that it is lower-skill activities that become redundant earlier and are thus at risk of being relocated first. Unlike Davidson et al. (2008) we start from this hypothesis to lay out our model below and carry out our welfare analysis; that is,

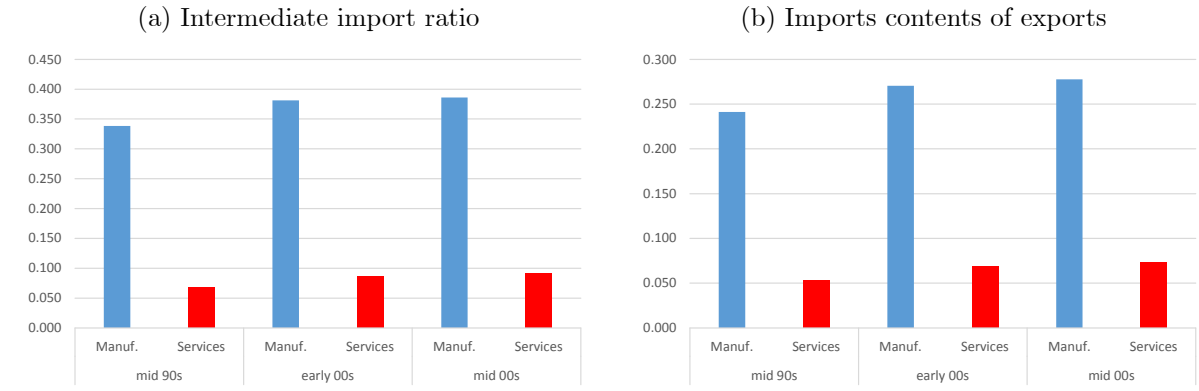
[3]Notice that due to the structure of the data it was not possible to distinguish between the offshoring of manufacturing and services occupations, but rather, between the offshoring emerging from both the manufacturing and services sectors, as defined by the usual measures of intermediate trade.

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low-skill offshoring is significantly more prominent than high-skill and, consequently, deserving of more attention in terms of welfare effects.[4]

The remainder of the paper is organized as follows. In section 2 the model and its main properties are stated, while possible types of equilibria are discussed. In section 3 we outline the strategy for the solution of the model. The welfare effects of the proposed policies as well as the additional exercise on the upgrading of low-skill workers are studied in section 4. Final remarks are summarized in section 5.

Figure 2: Offshoring trends by sector, 5-year world averages



Source and notes: see Figure 1.

2 Model

We adapt the model in Albrecht and Vroman (2002) to the case of low-skill offshoring.[5] As in there, agents are infinitely lived and there are many workers and firms of measure one. An exogenous fraction q of risk neutral workers is low-skill, L, and the rest are high-skill, H. Firms place vacancies of both skill types and the cost c of opening a vacancy is exogenous. A fraction ϕ of vacancies is low-skill and a fraction $1-\phi$ is high-skill, and their distribution is endogenous. A high-skill worker is allowed to take both types of jobs, whereas a low-skill worker can only fill a vacancy that corresponds to his type.

If a worker of any type is employed, he gets a wage corresponding to the type of vacancy and the type of skills he has. A worker of type L (H) working in a job of type L (H) will get a wage w_L (w_H). A worker of type H working in an L type job will get $w_{L(H)}$. Wages earned by high-skill mismatched workers will be usually higher than wages

[4] Low-skill or 'blue collar' offshoring is also more prominent in the literature—see for instance Jung and Mercenier (2014) for a recent study.

[5] A description of how the model works for one type of worker can be found in Rogerson et al. (2005).

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of low-skill workers matched correctly with a low-skill job, hence $w_H > w_{L(H)} > w_L$.[6] If a worker is unemployed he is entitled to the unemployment benefit b, and any worker can refuse the job if his reservation wage is not met. Jobs are lost at the exogenous rate δ.

In the described setup two types of equilibria may be realized: the equilibrium with cross skill matching (CSM) and the equilibrium with ex post segmentation (EPS). CSM occurs when high-skill workers and low-skill vacancies are matched, EPS takes place when these potential matches do not meet, i.e. high-skill workers only work in high-skill jobs. The type of equilibria achieved depends on the expectations of high-skill workers about the labor market and their willingness to accept a low-skill job.

Firms and workers meet according to a matching technology $M(u, v)$ where u represents unemployed workers (unemployment rate), and v vacancies. In this process an endogenously determined fraction γ of unemployed workers will be low-skill. Arrival of jobs to workers happens at a rate $\frac{M(u,v)}{u}$, arrival of workers to employers at a rate $\frac{M(u,v)}{v}$, and market tightness is defined as $\theta = \frac{v}{u}$. Then we can write the job arrival rate to workers as $m(1, \frac{v}{u}) = m(\theta)$ and workers' arrival rate to firms as $\frac{\frac{M(u,v)}{u}}{\frac{v}{u}} = \frac{m(\theta)}{\theta} = z(\theta)$. If the match succeeds, the worker gets a wage w_i, $i = L$, $L(H)$, H, with an expected lifetime utility W_i from earning the wage w_i. Firms' profits depend on the level of output and the incurred costs, to wit, wages and searching. Profits are $y_L - w_L - c$ and $y_L - w_{L(H)} - c$ in the case that a low-skill firm employs a low and high-skill worker, respectively, and $y_H - w_H - c$ in the case that a high-skill firm employs a high-skill worker.[7] High-skill firms are more productive than low-skill firms, $y_H > y_L$, while the firm's expected discounted profits are J_i, $i = L$, $L(H)$, H.

If the agreement is not achieved, the worker's income corresponds to the unemployment benefit b and his lifetime expected utility is U_j, $j = L$, H. In such a case, the firm ends up with an unfilled vacancy of value V_j, $j = L$, H. We thus have W_i that stands for the value of working and U_j for the value of unemployment, while J_i stands for the value of the job and V_j for the value of the vacancy for the corresponding type. There is something to bargain over if the value of working is higher than the value of unemployment $W_H > U_H$, $W_{L(H)} > U_H$ and $W_L > U_L$, and when the value of the job is higher than the value of the vacancy, $J_H > V_H$, $J_{L(H)} > V_L$ and $J_L > V_L$. Wages are

[6] In some particluar situations the market can collapse and only low-skill jobs will be offered, i.e. $\phi = 1$, and consequently all wages will converge to w_L (see Albrech and Vroman, 2002, pp. 294 and 303).

[7] High-skill workers who occupy low-skill jobs are equally productive on that job as their low-skill counterparts, i.e. they both produce y_L.

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set in a Nash bargaining process

$$w_L = \beta(y_L - c) + (1-\beta)rU_L, \quad (1)$$

$$w_{L(H)} = \beta(y_L - c) + (1-\beta)rU_H, \quad (2)$$

$$w_H = \beta(y_H - c) + (1-\beta)rU_H \quad (3)$$

where β is the bargaining power of workers and r is the rate at which agents discount future time periods.[8]

Workers may experience spells of employment and unemployment. When the flow of workers into and out of each employment state coincide, the steady-state equilibrium is achieved. In the steady state, low-skill workers that were working

$$E_L = q - \gamma u, \quad (4)$$

and lose their jobs, equal the low-skill unemployed $q - E_L$, that find a job (right hand side)

$$\delta E_L = \phi m(\theta)\left(q - E_L\right) \quad (5)$$

and high-skill workers that were working

$$E_H = 1 - q - (1-\gamma)\, u, \quad (6)$$

and lose their jobs, equal the high-skill unemployed $1 - q - E_H$, that find a job (right hand side) [9]

$$\delta E_H = m(\theta)\left(1 - q - E_H\right). \quad (7)$$

Rewriting (5) and (7) using (4) and (6) we can get the expressions for the unemployment rate and the fraction of low-skill vacancies as in Albrecht and Vroman (2002)

$$u = \frac{\delta\left(1-q\right)}{m(\theta)\left(1-\gamma\right) + \delta\left(1-\gamma\right)}, \quad (8)$$

$$\phi = \frac{\left(1-\gamma\right)qm(\theta) + \delta\left(q-\gamma\right)}{m(\theta)\gamma\left(1-q\right)}. \quad (9)$$

[8] In the Nash bargainig process wages are chosen to maximize

$$\max_{\{w_i\}} \left[W_i(w_i) - U_j\right]^{\beta} \left[J_i(y_j - w_i) - V_j\right]^{1-\beta}.$$

[9] Remember that there are q low-skill workers in the labor force and ϕ low-skill jobs offered. Also, a fraction γ of unemployed is low-skill, and high-skill workers can take both types of jobs and both types of jobs meet workers at the same rate.

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2.1 Cross Skill Matching Equilibrium

Let us describe the equilibrium equations in the case of CSM, namely, when high-skill workers are willing to take low-skill jobs and low-skill firms can afford to pay them.

Bellman equations that characterize the employed workers are

$$\begin{aligned} rW_L &= w_L - \delta(W_L - U_L), && (10)\\ rW_{L(H)} &= w_{L(H)} - \delta\left[W_{L(H)} - U_H\right], && (11)\\ rW_H &= w_H - \delta(W_H - U_H) && (12) \end{aligned}$$

where the discounted value of working must be equal to the flow of income (wages) and the expected loss from changing the employment status (losing the job). Corresponding equations for unemployed workers are

$$\begin{aligned} rU_L &= b + \phi m(\theta)\left(W_L - U_L\right), && (13)\\ rU_H &= b + m(\theta)[\phi W_{L(H)} + (1-\phi)W_H - U_H] && (14) \end{aligned}$$

where the discounted value of being unemployed must be equal to the flow of income (unemployment benefits) and the expected gain from finding a job. Bellman equations for the active firms are

$$\begin{aligned} rJ_L &= (y_L - w_L - c) - \delta\left(J_L - V_L\right), && (15)\\ rJ_{L(H)} &= \left[y_{L(H)} - w_{L(H)} - c\right] - \delta[J_{L(H)} - V_L], && (16)\\ rJ_H &= (y_H - w_H - c) - \delta\left(J_H - V_H\right) && (17) \end{aligned}$$

where the discounted value of the job must be equal to the flow of profits earned by the active firm and the expected loss from changing the labor market status (becoming an inactive firm). Corresponding equations for inactive firms are

$$\begin{aligned} rV_L &= -c + z(\theta)\left[\gamma J_L + (1-\gamma)J_{L(H)} - V_L\right], && (18)\\ rV_H &= -c + z(\theta)(1-\gamma)\left(J_H - V_H\right) && (19) \end{aligned}$$

where the discounted value of the vacancy must be equal to the flow of income lost by maintaining the vacancy open and the expected gain from switching to the active status. The condition for CSM equilibrium to exist is that matches between high-skill

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workers and low-skill jobs are realized, which happens when [10]

$$y_L - c > rU_H. \tag{20}$$

There is free entry into the market, and new firms enter while the value of vacancy is positive. Yet, in the steady-state equilibrium, no more firms enter as the value of the vacancy decreases to zero

$$V_L = 0 \text{ and } V_H = 0. \tag{21}$$

Definition 1 *In Cross Skill Matching (CSM) steady-state equilibrium the following conditions must hold:*
(i) workers' Bellman equations (10), (11), (12), (13) and (14),
(ii) firms' Bellman equations (15)-(17), (18) and (19),
(iii) Nash bargaining conditions (1), (2) and (3),
(iv) steady state conditions (5) and (7),
(v) zero vacancy value conditions (21) and
(vi) CSM equilibrium condition (20).

In CSM steady-state equilibrium the aggregate level of output is

$$Y^{CSM} = E_L y_L + \phi E_H y_L + (1-\phi) E_H y_H.$$

Each worker employed in low-skill firms produces y_L, each worker employed in high-skill firms produces y_H.

Given that we are also interested in measuring social welfare we account for the lifetime utility of both employed and unemployed workers as follows

$$\Omega^{CSM} = E_L W_L + \phi E_H W_{L(H)} + (1-\phi) E_H W_H + (q - E_L) U_L + (1 - q - E_H) U_H.$$

2.2 Ex Post Segmentation Equilibrium

Let us describe now the equilibrium equations in the case of EPS, when high-skill workers are only matching with high-skill firms.

Bellman equations that characterize the employed workers are (10) and (12), corresponding equations for unemployed workers are (13) and

$$rU_H = b + (1-\phi) m(\theta) (W_H - U_H). \tag{22}$$

[10] Conditions $J_{L(H)} > V_L$ and $W_{L(H)} > U_H$ must hold. We can obtain the CSM equilibrium condition by processing the corresponding Bellman equations.

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Bellman equations for the active firms are (15) and (17), and for the inactive firms are

$$rV_L = -c + z(\theta)\gamma\left(J_L - V_L\right) \tag{23}$$

and (19).[11] The condition for EPS equilibrium to exist is that high-skill workers are matching only with high-skill jobs

$$y_L - c \leq rU_H. \tag{24}$$

Definition 2 *In Ex Post Segmentation (EPS) steady-state equilibrium, the following conditions must hold:*
(i) workers' Bellman equations (10), (12), (13) and (22),
(ii) firms' Bellman equations (15), (17), (23) and (19),
(iii) Nash bargaining conditions (1) and (3),
(iv) steady state conditions (5) and (7),
(v) zero vacancy value conditions (21) and
(vi) EPS equilibrium condition (24).

In EPS steady-state equilibrium the aggregate level of output is

$$Y^{EPS} = E_L y_L + E_H y_H$$

and social welfare is given by

$$\Omega^{EPS} = E_L W_L + E_H W_H + \left(q - E_L\right) U_L + \left(1 - q - E_H\right) U_H.$$

3 Solving the model

In the steady-state equilibrium the value of both vacancies goes to zero, as in equation (21). Combining the equilibrium equations we can obtain two free entry condition loci $\gamma = f_{V_L=0}(\theta)$ and $\gamma = f_{V_H=0}(\theta)$. The intersection of the two loci determines the fraction of low-skill unemployment γ and the market tightness θ. The two functions may be non-monotonic and multiple equilibria may arise.

In order to solve the model numerically we need to specify the matching function.

[11] Notice that the equations (22) and (23) now reflect that high-skill unemployed workers are only going to take high-skill jobs and low-skill firms will ony hire low-skill workers.

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We assume that $M(u,v) = 2\sqrt{uv}$, which implies

$$\begin{aligned} m(\theta) &= 2\sqrt{\theta} \text{ and} \\ z(\theta) &= \frac{2}{\sqrt{\theta}}. \end{aligned}$$

3.1 Cross Skill Matching Equilibrium

Rewriting (15)-(17) we get

$$J_L = \frac{y_L - w_L - c}{r+\delta}, \tag{25}$$

$$J_{L(H)} = \frac{y_L - w_{L(H)} - c}{r+\delta}, \tag{26}$$

$$J_H = \frac{y_H - w_H - c}{r+\delta}. \tag{27}$$

Using (13) and (14) in combination with (1)-(3) and (10)-(12) we can write

$$rU_L = \frac{b\,(r+\delta) + \beta\phi m(\theta)\,(y_L - c)}{[r+\delta+\beta\phi m(\theta)]}, \tag{28}$$

$$rU_H = \frac{b\,(r+\delta) + \beta m(\theta)\left[\phi y_{L(H)} + (1-\phi)\,y_H - c\right]}{[r+\delta+\beta m(\theta)]}. \tag{29}$$

Then when $V_L = 0$, plugging (25), (26), (28) into (18) we get the $\gamma = f_{V_L=0}(\theta)$ for low-skill workers

$$L \text{ locus: } c = z(\theta)\,(1-\beta)\left\{\gamma\tfrac{(y_L-c-b)}{[r+\delta+\beta\phi m(\theta)]} + (1-\gamma)\tfrac{(y_L-c-b)(r+\delta)+\beta m(\theta)(1-\phi)(y_L-y_H)}{(r+\delta)[r+\delta+\beta m(\theta)]}\right\}$$

where ϕ is given in (9) and is a function of the endogenous γ and θ. When $V_H = 0$, plugging (27), (29) into (19) we get the $\gamma = f_{V_H=0}(\theta)$ for high-skill workers

$$H \text{ locus: } c = z(\theta)\,(1-\beta)\,(1-\gamma)\frac{(y_H - c - b)\,(r+\delta) + \beta m(\theta)\phi\,(y_H - y_L)}{(r+\delta)\,[r+\delta+\beta m(\theta)]}.$$

Taking the assumed matching function, the locus for low-skill workers can be solved numerically. The locus for high-skill workers can be solved analytically. It is a second degree polynomial in $\sqrt{\theta}$

$$\begin{aligned} H \text{ locus:} \qquad 0 = &-c\,(r+\delta)\,2\beta\theta + \left\{-c\,(r+\delta)^2 + \frac{4\,(1-\gamma)^2\,(1-\beta)\,\beta q\,(y_H - y_L)}{\gamma\,(1-q)}\right\}\sqrt{\theta} \\ &+2\,(1-\gamma)\,(1-\beta)\left\{(y_H - c - b)\,(r+\delta) + \frac{\beta\delta\,(q-\gamma)\,(y_H - y_L)}{\gamma\,(1-q)}\right\}. \end{aligned}$$

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3.2 Ex Post Segmentation Equilibrium

Rewriting (15) and (17) we get (25) and (27). Using (13) and (14) in combination with (1), (3), (10) and (12) we get (28) and

$$rU_H = \frac{b\,(r+\delta) + \beta\,(1-\phi)\,m(\theta)\,(y_H - c)}{[r+\delta+\beta\,(1-\phi)\,m(\theta)]}. \tag{30}$$

Then when $V_L = 0$, plugging (25) and (28) into (23) we get the $\gamma = f_{V_L=0}(\theta)$ for low-skill workers

$$L \text{ locus: } c = z(\theta)\,(1-\beta)\,\gamma\frac{(y_L - c - b)}{[r+\delta+\beta\phi m(\theta)]}.$$

When $V_H = 0$, plugging (27) and (30) into (19) we get the $\gamma = f_{V_H=0}(\theta)$ for high-skill workers

$$H \text{ locus: } c = z(\theta)\,(1-\beta)\,(1-\gamma)\frac{(y_H - c - b)}{[r+\delta+\beta\,(1-\phi)\,m(\theta)]}.$$

Taking the assumed matching function, the locus for low-skill workers is the following polynomial

$$L \text{ locus: } 0 = \theta\frac{2c\beta q\,(1-\gamma)}{(\gamma+q-2\gamma q)} + \sqrt{\theta}c\left[r+\delta+\frac{\beta\delta\,(q-\gamma)}{(\gamma+q-2\gamma q)}\right] - 2\gamma\,(1-\beta)\,(y_L - c - b)$$

and the locus for high-skill workers

$$H \text{ locus: } 0 = \theta\frac{2c\beta\gamma\,(1-q)}{(\gamma+q-2\gamma q)} + \sqrt{\theta}c\left[r+\delta+\frac{\beta\delta\,(q-\gamma)}{(\gamma+q-2\gamma q)}\right] - 2(1-\gamma)\,(1-\beta)\,(y_H - c - b)\,.$$

Once the values of γ and θ are derived, all equilibrium values are easily obtained using the equilibrium equations.

4 Parametrization and comparative statics

In this section we parametrize our model and then carry out a comparative statics exercise to account for different policy measures that can possibly compensate for the welfare effects of offshoring. By changing the model's parameters it is possible to examine three possible scenarios: (i) the movement from a CSM equilibrium to another CSM; (ii) a switch from a CSM equilibrium to an EPS equilibrium; and (iii) the movement from an EPS equilibrium to another EPS.[12]

[12] Notice that the EPS equilibrium is more likely to exist when the productivity gap between the two types of workers is high, i.e. when $y_H >> y_L$, and consequently the wages in low-skill firms are too low to entice high-skill workers into these jobs.

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In the offshoring literature offshoring is often identified as a source of skill-biased technical change. In our setting, skill-biased technical change can be seen as an increase of output produced in high-skill jobs while the output from low-skill jobs remains constant. Similarly, this can also be represented as a fall in the productivity levels of low-skill workers while keeping the productivity of high-skill workers fixed. Hence, introducing cheap imports due to a liberalization process or the increase of offshoring will reduce the value of the output of low-skill jobs.[13] We will focus on the latter case alone as is the one consistent with offshoring.

We use the following baseline parameters: the rate at which the employment relationship is broken is $\delta = 0.2$, meaning that jobs last on average 5 years, agents discount the future at a constant rate $r = 0.05$, there are $q = 2/3$ of low-skill workers in the labor force (and $1/3$ who are high-skill), and the bargaining power of workers is the same as that of the firms, $\beta = 0.5$. The baseline value of the unemployment benefit is $b = 0.1$ and the cost of opening a vacancy is $c = 0.3$. The output produced by high-skill workers in a high-skill firm is assumed to be $y_H = 1.2$. The baseline value of the output in a low-skill firm will change in order to generate a CSM or an EPS equilibrium. When, under the baseline parameters, the productivity gap is such that $y_H - y_L \leq 0.327$, then the CSM equilibrium exists, i.e. high-skill workers match with both high and low-skill firms. However, high-skill workers may stop matching with low-skill firms when the productivity gap is such that $y_H - y_L > 0.25$. Thus, we have an interval where both equilibria are possible and the actual outcome depends on the expectations of high-skill workers about the economy and their willingness to accept, or not, a low-skill job.

Let us now preview the general initial effects of offshoring in our model—that is, previous to any compensating policy measure. As seen in Table 1, a reduction in the productivity of low-skill labor yields the following qualitative results: 1) it raises the unemployment rate (u); 2) it reduces the fraction of vacancies that are low-skill (ϕ); 3) it brings down the wages in low-skill jobs $\left(w_L \text{ and } w_{L(H)}\right)$; 4) it cuts production down (Y); and 5) it reduces welfare (Ω). Changes in the wages of the high-skill workers depend on the kind of equilibrium: high-skill wages are harmed under CSM but improved under EPS.

We now proceed to analyze three comparative statics exercises, involving two appreciably different policy measures with quite different outcomes—an increase of the unemployment benefits and a reduction of the vacancy costs, and skill upgrading of low-skill workers.

[13] Remember that offshoring intensity can be measured as an intermediate inputs ratio or a vertical specialization index as we did above.

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Table 1: Effects of offshoring compensated by alternative policy measures

(i) CSM to CSM	y_L	b	c	q	θ	u	γ	ϕ	w_L	$w_{L(H)}$	w_H	Y	Ω
Baseline	1.000	0.100	0.300	0.667	1.68	0.072	0.67	0.98	0.651	0.653	0.753	0.93	12.24
Offshoring	0.975	0.100	0.300	0.667	1.60	0.078	0.69	0.91	0.624	0.636	0.748	0.91	11.80
Policy 1	0.975	**0.313**	0.300	0.667	0.96	0.108	0.72	0.77	0.630	0.658	0.771	0.88	12.24
Policy 2	0.975	0.100	**0.2795**	0.667	1.80	0.074	0.69	0.90	0.644	0.658	0.771	0.91	12.24
L-upgrading	0.975	0.100	0.300	**0.455**	1.60	0.098	0.59	0.54	0.598	0.671	0.783	0.93	12.24

(ii) CSM to EPS	y_L	b	c	q	θ	u	γ	ϕ	w_L	$w_{L(H)}$	w_H	Y	Ω
Baseline	0.94	0.100	0.300	0.667	1.49	0.086	0.71	0.82	0.586	0.614	0.744	0.87	11.20
Offshoring (CSM)	0.88	0.100	0.300	0.667	1.31	0.10	0.74	0.69	0.523	0.577	0.737	0.82	10.23
Offshoring (EPS)	0.88	0.100	0.300	0.667	1.38	0.14	0.64	0.53	0.511	–	0.775	0.84	10.54
Policy 1	0.88	**0.296**	0.300	0.667	0.84	0.18	0.67	0.49	0.529	–	0.795	0.81	11.20
Policy 2	0.88	0.100	**0.2695**	0.667	1.66	0.13	0.64	0.53	0.543	–	0.808	0.86	11.20
L-upgrading	0.88	0.100	0.300	**0.542**	1.46	0.14	0.59	0.44	0.503	–	0.792	0.88	11.20

(iii) EPS to EPS	y_L	b	c	q	θ	u	γ	ϕ	w_L	$w_{L(H)}$	w_H	Y	Ω
Baseline	0.94	0.100	0.300	0.667	1.49	0.137	0.63	0.55	0.567	–	0.774	0.88	11.22
Offshoring	0.88	0.100	0.300	0.667	1.38	0.143	0.64	0.53	0.511	–	0.775	0.84	10.54
Policy 1	0.88	**0.302**	0.300	0.667	0.82	0.18	0.68	0.49	0.530	–	0.796	0.81	11.22
Policy 2	0.88	0.100	**0.2685**	0.667	1.67	0.13	0.64	0.53	0.544	–	0.809	0.86	11.22
L-upgrading	0.88	0.100	0.300	**0.538**	1.46	0.14	0.59	0.44	0.503	–	0.792	0.88	11.22

Notes: Policy 1 is increase of unemployment benefits (b), Policy 2 is reduction of vacancy costs (c), and L-upgrading is reduction of the low-skill share (q).

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4.1 Unemployment benefits

Let us first consider the effects of increasing the unemployment benefits (b) right after offshoring sets in, as displayed in the rows labeled 'Policy 1' in Table 1. We can see there, in segment (i), that a drop in y_L from 1 to 0.975 (or a widening of the productivity gap from 0.2 to 0.225) can be fully compensated in terms of welfare (last column to the right) by increasing the unemployment benefits from 0.1 to 0.313 (213%). As a result, the wages of offshored workers w_L drop, but less than in the case of no compensation. Furthermore, the wages of high-skill workers in both types of jobs increase—as the reservation wage increases, firms have to compensate with higher wages to attract workers. As more workers are now idle, output falls even further, from 0.93 to 0.91 when no compensation and to 0.88 when compensated. Moreover, the unemployment rate rises from 7.2% to 7.8% when no compensation and to 10.8% when compensated.

If the initial position is such that the productivity gap is wider, as in segment (ii), and income y_L further decreases, we may observe a switch in the equilibrium. In this case we reduce y_L from 0.94 to 0.88 (a 6.38% drop in low-skill output) and the output gap goes from 0.26 to 0.32 (23%). Welfare compensation in the form of increased unemployment benefits pushes the economy into an EPS equilibrium. A compensating change in the unemployment benefits requires b to rise a sizeable 196%. We can see, however, the sharp rise of the unemployment rate along with the significant fall of the wages of low-skill workers, yet the ones under EPS equilibrium with intervention are comparable to the ones under CSM equilibrium without intervention. High-skill workers would benefit again as their wages w_H experience an 8% increase.

Segment (iii) describes the passage from an EPS to another EPS equilibrium and is not that different from the previous one—in fact, the 'Offshoring' rows in both segments are identical, yet not the 'Baseline' rows as the equilibria we depart from are different. Notice that, as before, it would require a huge rise of the unemployment benefits (202%) to maintain previous levels of welfare.

Consequently, we can argue that raising the unemployment benefits to compensate for the welfare loss that is bound to happen when low-skill offshoring takes place is a rather expensive and therefore unjustified counter measure—as the improvement in welfare comes largely from paying idle workers.

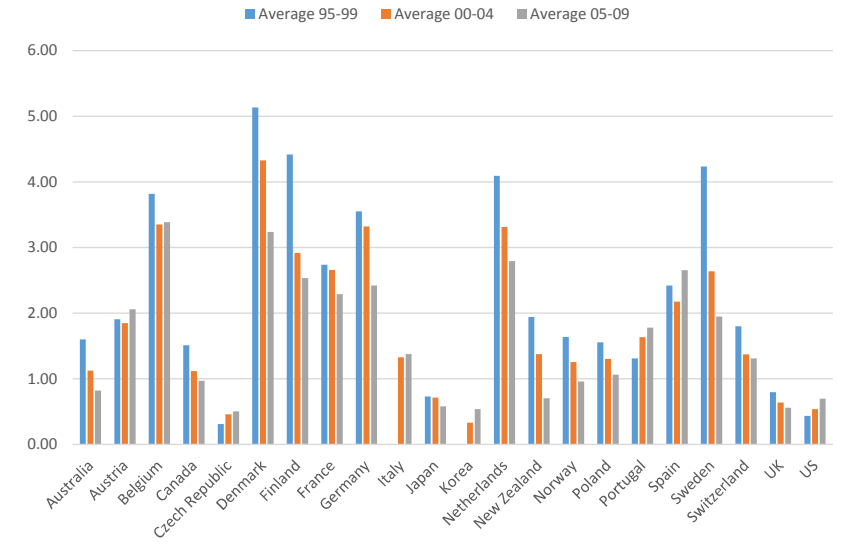
Figure 4 puts some color to our previous exercise and shows how active governments have been for the past 15 years in relation to labor market policies in general. With a few exceptions, we observe an extensive declining trend in active and passive policy measures, which, in many cases, is quite remarkable.[14] For example, Spain, Portugal, Austria, Czech Republic and the US have experienced mild to very little increases of their spending in both active and passive measures, while for the rest the trend has been

[14] The sample here is the same as in the introduction.

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the opposite. It is also to remark the very sharp reduction which has taken place in the Baltic countries, quite likely as a result of the lack of long-run sustainability of their extensive welfare states. Notice that, according to our welfare analysis, policy makers in any of these countries would have to push for a trebling of their current expenditures in labor market policies. This is politically impossible and at the same time highly disruptive, even for countries with 'light welfare states' and no debt problems. Not only will this pose a future threat for public finance, but it will also represent a major disincentive for those willing to work.

Figure 4: Labor market policies, % of GDP



Source: OECD Labour Market Programmes Dataset (2013).

Notes: public expenditures on both active and passive measures.

4.2 Labor market flexibility

Let us now discuss the effects of our alternative policy measure, the flexibilization of the labor market by way of a reduction of the vacancy costs (c), as seen in the rows labeled 'Policy 2' in Table 1. A fall of y_L in segment (i) from 1 to 0.975 (2.5%) due to offshoring can now be offset by a cutback of the vacancy costs by the order of 6.8%, from 0.3 to 0.2795. As in the case of unemployment benefits the wages of low-skill workers threatened by offshoring go down, albeit not as much as before, whereas the wages of high-skill workers in both jobs increase exactly as much as with the previous measure. Output, even when lower than in the baseline scenario, is not as much reduced as with Policy 1, and the unemployment rate stays at a reasonable 7.4% which is very similar to the original 7.2%—the unemployment rate would have stayed at 7.8% when no measure or much higher at 10.8% under the alternative policy.

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Accounting for a wider productivity gap and the possibility of a switch in the equilibrium in segment (ii), we notice that the needed reduction in the vacancy cost would have to be now of the order of 10.2%. The unemployment rate, in turn, even when higher than the baseline case, is slightly lower than without flexibilization, while the same can be said about the wages for low-skill—lower than the baseline case but significantly higher than when no flexibilization, both under CSM or EPS. High-skill workers experience now a rise of around 10% in w_H, with respect to the scenario right after offshoring takes place under a CSM equilibrium. Finally, segment (iii) shows that the reduction in the vacancy cost necessary to compensate for offshoring should now be of around 10.5%.

Notice further the stark differences in performance as delivered by the two policies, which can be clearly seen in rows 'Policy 1' and 'Policy 2'. In spite of showing the same level of welfare, as that was the goal of the exercise, we can point out that the second policy consistently displays a significantly lower unemployment rate, higher wages for low and high-skill workers (but particularly for the former), and a higher level of output. Overall, Policy 2 seems to be more desirable on account of its sustainability, given that it only represents a reduction of the vacancy costs ranging from around 7% to 10%—no doubt something achievable and within the reach of most policy makers.

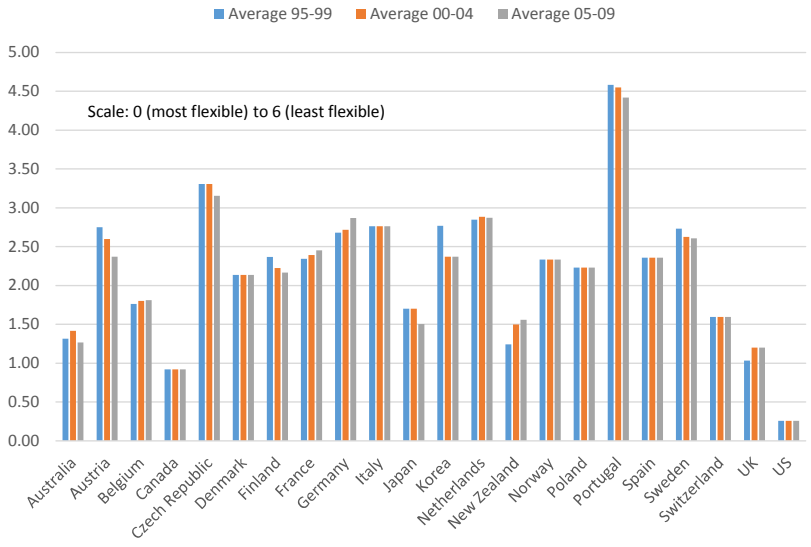
Figure 5 shows the changes in the level of employment protection for the same group of countries as in the previous sections. We can see that, in spite of the differences among countries, the policy regarding employment protection has remained very much the same. Notice that even when c in our model simply refers to the cost of creating and maintaining a vacancy, it is still accounted for in the OECD strictness indicator as this includes both the regulations on dismissals and the use of temporary contracts—the latter having a direct impact on the hiring process of firms. Vacancy costs usually include advertisement, the time cost of the internal recruiter, the time cost taken by the interviews, drugs screens and background checks, and various pre-employment assessment tests. When it comes to the indicator presented here, a reduction of the vacancy cost may be brought about by a loosening up of the regulations involving temporary workers, as this will probably reduce the administrative burden faced by the firms.

Likewise, employment subsidies seem bound to have the same effect on hiring (Phelps, 1994) either at the expense of the taxpayer or lower welfare entitlements. Finally, it can be argued too that reducing the firing costs can bring c down, as this can be broadly thought as including the costs which firms will have to face sooner or later. Labor market policies can strongly define the pattern of trade and the effects of trade in general (see Helpman and Itskhoki, 2007), and offshoring is just another form of trade.[15]

[15]Davidson and Matusz (2006) evaluate the effects of four different policies in the broader context

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Figure 5: Employment protection, strictness indicator



Source: OECD Employment Protection Dataset (2013).

Notes: OECD indicator (v.1) of regulations on dismissals and use of temporary contracts.

4.3 Upgrading of low-skill workers

Skill upgrading can be understood as a change in relative wages reflecting a change in productivity levels.[16] As seen in Table 1, skill upgrading can be interpreted as a shift favoring the relative wages of high-skill workers both before and after the implementation of policies (rows 'Offshoring', 'Policy 1 and 2'). However, another expected outcome of offshoring involves the recycling and upgrading of those low-skill workers who have lost their jobs. To be sure, once those low-skill jobs have been relocated, firms will have more room for new goods and services that will be produced with new technologies using higher skill requirements. Workers who are able to seize the opportunity by getting trained in new skills and thus by becoming high-skill workers will eventually command higher wages.[17]

Let us further discuss the results in Table 1, in particular, those under 'L-upgrading'. Assuming then that in the face of the offshoring threat low-skill workers will change their status to that of high-skill, the question would now be, how much of a drop in q will be needed to compensate for the initial welfare loss? Notice that high-skill workers, even when in low-skill occupations, can still command higher wages than low-skill workers,

of globalization: unemployment benefits, training subsidies, employment or wage subsidies. They conclude that wage subsidies are the preferred policy as they give the highest incentive for re-employment.

[16] Empirical evidence on this subject abounds; see, among several others, Berman et al. (1994) and Feenstra and Hanson (1996) for the US, Geishecker and Görg (2005) for Germany, Head and Ries (2002) for Japan, and Hijzen et al. (2005) for the UK.

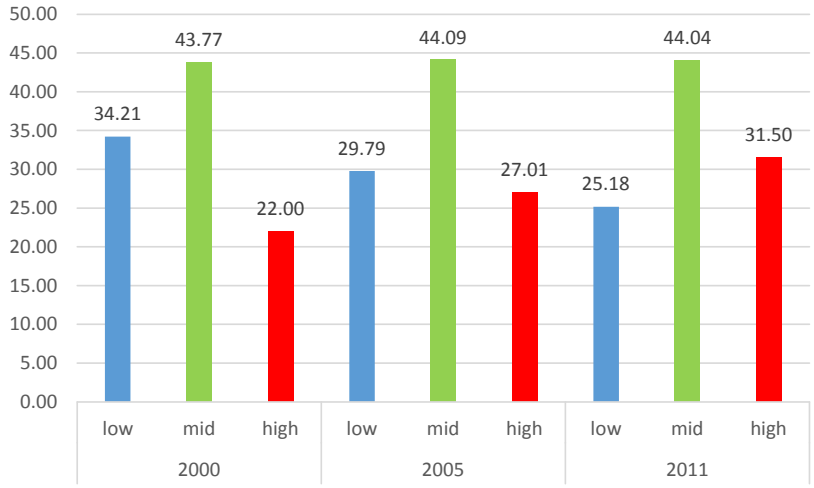
[17] Be aware that the mechanism by which workers react to offshoring by improving their skills is missing from our present model and, hence, considered exogenous. This is however left for the future.

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or $w_{L(H)} > w_L$.[18]

Segment (i) of the table shows that as long as the economy remains at a CSM equilibrium the upgrading needed will be significant—q will have to drop from 67% to 46%, a difference of more than 20 points. Segments (ii) and (iii), instead, which respectively portray the transitioning into an EPS and an EPS-EPS move, would require a less drastic change—in both cases q would only need a 13-point fall, approximately. Figure 6 shows a clear trend pointing in the direction of skill upgrading of low-skill workers since the early 2000s. Notice there the sharp shift from low to high levels of education attained while the share of those in the middle has remained practically unchanged. In other words, people are fast adapting to the ever increasing requirements of globalized firms by acquiring more skills by way of higher levels of education.

Figure 6: Education attained, OECD avg. (25-64 year-olds, %)



Source: OECD Education GPS, Chapter A (2012).

Notes: low is below upper secondary level, mid is secondary and post-secondary, and high is tertiary.

As compared to the policy measures 1 and 2 the effects of an upgrading of low-skill workers are quite varied. For instance, θ and u remain right between the values for the two policy measures in all three segments of the table, whereas γ and ϕ are unambiguously lower. Moreover, wages for high-skill in both jobs are the highest in segment (i), but the lowest in the other two segments, while the wages for low-skill are hurt the most in all three scenarios. Finally, output turns out to be the highest under upgrading of low-skill workers in all three segments.

[18] Remember that both high and low-skill workers produce the same output at a low-skill job. Therefore, the premium paid to the high-skill worker at a high-skill job only makes sense in the expectation of a change in the technology used by the firm—something which is certainly bound to happen when the economy transitions into an EPS equilibrium, due to a change of the high-skill workers' expectations.

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Indeed, in the lack of a consensus from the majority of the political forces to effect one of the two alternatives previously discussed, there is still the possibility of upgrading for those at the bottom of the skill ladder. This, as we can see, would also bring welfare to pre-offshoring levels. Of course, this upgrading can also be encouraged by a combination of policies aimed at the re-employment of dismissed workers (see, among others, Phelps, 1994, Davidson and Matusz, 2006, and Jung and Mercenier, 2014).

5 Conclusions

We have relied on the model by Albrech and Vroman (2002) to perform a quantitative analysis of the effects of low-skill offshoring on the welfare of the economy. Two government policies, unemployment insurance and labor market flexibilization, were used to offset the negative effects of offshoring. We show that the welfare loss due to low-skill offshoring can be compensated with both measures. As per our welfare analysis, it would require a huge increase of the unemployment benefits to compensate for the negative welfare effects of offshoring. On the other hand, it would only require a relatively small reduction in the vacancy cost to achieve the pre-offshoring welfare levels. Thus, the recommended welfare improving tool is flexibilization. It is clearly more employable due to its lower costs and its being less intrusive in terms of work disincentives and economic activity.

Furthermore, an additional exercise reveals that if low-skill workers adjust themselves to higher skill requirements (upgrading) the welfare loss can also be compensated. These adjustments can vary widely depending on the equilibria involved, and could be encouraged by re-employment and re-training programs as discussed earlier.

Possible extensions of the model include, for example, adding the government budget and endogenizing the mechanism by which low-skill workers become high-skill when confronted with offshoring. We think these additions will help assessing, on the one hand, the effect of the chosen policies on public finance, and on the other, the effect of recycling and re-training programs on the future productivity levels of low-skill workers. Calibration of the model for some of the countries shown in Figures 4–6 is also in the agenda.

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