NORTH-HOLLAND

Economic Note

Investment in Good Jobs

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Relaxing the standard assumption of one price in labor markets, we evaluate the impact of labor subsidies, namely, the effects of an industrial policy designed to reallocate workers from low-wage to high-wage industries through subsidization of training costs. We found that the welfare gains can be substantial, and, in contrast to well-established results, the wage gap between low-paid workers and high-paid workers is actually reduced.

1. INTRODUCTION

A necessary condition for industrial policy is the existence of market imperfections that causes factors of production in certain industries to earn economic rents. In fully competitive labor markets, firms hire factors up to the point at which the value of their marginal product is equal to their marginal cost, and wages are the same in all sectors so that there is no room for any industrial targeting.

Because, as we shall see in detail below, wages (adjusted for skill mix) are not equalized across sectors, and firms are assumed to operate on their labor demand curves, the marginal product of labor will not be equated across sectors, resulting in allocative inefficiency. In such a situation, there will be too little employment in high-wage sectors and too much employment in low-wage sectors. Welfare gains are then to be expected if a worker shifts into the high-wage/high-productivity sectors from elsewhere.

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We tackle the issue of labor subsidies assuming that the observed interindustry wage differences reflect different training technologies across industries, and hence, different turnover costs. Based on efficiency wage considerations, we then evaluate, within a general equilibrium framework, the impact of subsidies in Portuguese labor markets, namely, the effects of an industrial policy designed to reallocate workers from low-wage to high-wage industries through subsidization of training costs.

2. INTERINDUSTRY WAGE DIFFERENTIALS

Our approach to wage differentials reflects the empirical regularities reported by Dickens and Katz (1987), Kruegar and Summers (1988), and Katz and Summers (1989a), who observe that interindustry earnings differentials persist after controlling for the usual human capital variables, *inter al.* Of course, observed differences in earnings across industries may reflect unmeasured human capital quality. The argument usually made is that there is no reason to believe that observed and unobserved ability—quality of labor—are unrelated or vary across sectors in a systematic manner. Moreover, controlling for working conditions such as weekly hours, health hazards, commuting time, overtime hours, physical work conditions, and so on, does not seem to substantially change either the pattern of industry wages or the standard deviation of the industry wage differentials. Longitudinal evidence also casts some doubt on the hypothesis that industry wage differentials are due to unobserved individual heterogeneity. Indeed, looking at individual workers when they move between industries, either by reasons of displacement or voluntary quits, their wage changes tend to mirror existing industry wage differentials (e.g., Kruegar and Summers, 1988).

Crucial to our CGE implementation are the earnings function parameter estimates for the Portuguese labor markets, which were taken from Kiker and Santos (1991). There is, however, an important data qualification. These wage regressions do not control for working conditions. In other words, the observed wage differentials may well reflect compensating wage differentials for undesirable job characteristics. As mentioned, Krueger and Summers and Katz and Summers have suggested that the observed wage pattern does not substantially change after controlling for working conditions. But, can we comfortably generalize this finding to other countries? It seems, indeed, we cannot. Evidence from Sweden (Edin and Zetterberg, 1992), for instance, shows that the interindustry wage differences narrow sharply with the inclusion of working conditions variables. Unfortunately, we do not have such evidence from Portugal, but to proceed with our policy exercise we take the observed wage differences as noncompensating wage differentials.

Computation of wage differentials is as follows. Based upon the earnings function parameter estimates, we normalize the estimated industry wage differentials as deviations from the weighted mean differential. Following Krueger and Summers (1988, p. 263, fn. 4), we treat the omitted industry variable as having a zero effect on wages, compute the employment-weighted average of wage differentials for all industries, and report the difference between the industry differentials and the weighted average. The resulting key statistic, then, is the proportionate difference in wages between an employee in a given industry and the average employee. Based on this procedure we compute the estimated wage differentials for 17 industries, which are the raw data for our 40-sector model aggregation. Benchmark wage distortions are documented in Table 1.

3. TRAINING COSTS AND INDUSTRY PATTERNS OF TRAINING

The underlying hypothesis of our policy exercise is that high wages reflect efficiency considerations, namely that high wages are determined by higher industry-specific training costs. The usual argument (e.g., Salop, 1973) is that the presence of such costs make firms willing to pay a wage higher than would obtain in their absence so as to reduce costly turnover among trained workers. Under these conditions, it follows that firms do not have the incentive to lower wages even if there is an excess supply of willing applicants waiting in a queue to be hired. Thus, firms have to decide on the wage rate, the quit rate, and the scale of production. Individual workers, in turn, must decide about whether to quit the current job to search for better job alternatives, and whether to accept any offers when they are unemployed. Wage differences arise from the fact that the optimal wage for firms to pay will depend on their production/training technologies.

The economics of training is a complex matter and largely an open research field. Little is known on the extent and nature of training, and not much is known on why and how enterprises train, the resource costs and payoffs to training, and whether some labor market structures provide more or different incentives to effective training than others. Presumably, training will vary with age, sex, level of education, and industry. If young workers have higher mobility, firms will tend to offer them little or no training, or training will only be provided after they have proven their stability. There is also evidence that women are less likely to receive formal on-the-job training and/or employer-sponsored outside training; and that better educated workers are nearly always more likely to receive more training than their less educated counterparts.

The first crucial distinction to make is between specific and general training. Firm-specific training enhances productivity only in the firm that provides the training, whereas general training can be used in other firms once completed. In the simplest model, firms will never provide general training, unless employees are bound to the firm. Otherwise these firms will be seriously harmed ("poached") by free riders who have provided no training. This implies that workers will have to pay for general skills. Workers are in general, however, unable to acquire the required amounts of general training. Firms subject to less stringent liquidity constraints, with easier access to capital markets, are in a good position to provide general training, but they need to be sure that their investment will be recouped. In turn, if training provides specific skills, workers are less willing to finance the investment,and firms are equally reluctant to commit themselves to all training expenditures, fearing that workers will quit before they recoup their investment.

Table 1: Sector Identification and Wage Differentials (WD)

	Sector	WD		Sector	WD
AGR	Agriculture	−10.5	LEA	Leather and footwear	−17.5
FOR	Forestry	−10.5	WOO	Wooden products	10.0
FIS	Fishery	−10.5	PAP	Paper and printing	−2.6
REF	Petroleum refining	6.4	RUB	Rubber and plastic materials	−7.6
EGW	Electricity, gas & water	30.4	OMP	Other manufactured products	−7.6
FNF	Ferrous & nonferrous metals	8.2	CON	Building and construction	−1.9
ONM	Other nonmetal products	2.5	REP	Recovery and repair	−1.9
CMA	Construction materials	2.5	TRD	Wholesale and retail	1.6
CHM	Chemicals	6.4	RES	Hotels and restaurants	−9.8
FAB	Fabricated metal products	4.2	INL	Inland transport	6.9
MAC	Nonelectrical machinery	4.2	MAT	Maritime and air transport	6.9
ELM	Electrical machinery	4.2	AXT	Auxiliary transport services	6.9
VEH	Vehicles and other transport	4.2	COM	Communication	6.9
MEA	Meat processing	−5.2	BNK	Banking	15.3
MLK	Milk	−5.2	REN	Rental of immovable goods	15.3
CEP	Cereal products	−5.2	BSE	Business services to enterprises	15.3
OFP	Other food products	−5.2	MSE	Market services of education	−8.4
BEV	Beverages	−5.2	MSH	Market services of health	−8.4
TOB	Tobacco	−5.2	OMS	Other market services	−8.4
CLO	Textiles and clothing	−17.5	PUB	General public services	0.6

That is, in both general and specific training, training costs probably will be shared, and employees and employers will have to agree on wage and compensation schemes that raise job mobility costs and reduce turnover.

The most significant empirical regularities in training incidence across industries and across countries can be summarized as follows (e.g., OECD, 1991). Nondurable manufacturing industries, such as textiles, clothing, leather, and footwear, tend to have a relatively low incidence of training in most countries. The same obtains for construction, food, hotels and restaurants, and agriculture. By contrast, the financial sector is a high-incidence industry in the majority of the cases. Petroleum products, office machinery, electricity, machinery, and public services all seem to offer relatively more training. But the fragile nature of the training data, makes comparisons across countries and even across industries hazardous. Consider, for example, the retail sector. This industry is generally associated with high labor turnover, yet its training incidence is typically equal to or even higher than the respective national averages. This may be reflect the measure considered in the OECD study, which takes as its statistical unit the overall incidence of training. Although high turnover encourages employer reluctance to engage in training, it also makes for a continuous training effort, even if it is mostly of short duration.

4. THE SMALL OPEN ECONOMY (SOE) MODEL IMPLEMENTATION

4A. General Model Structure

The model is a general equilibrium model in the Arrow-Debreu tradition, and follows Harrison, Rutherford and Tarr (1993). It is a static, single-period CGE version, with a single household, no capital accumulation, constant returns to scale production with competitive pricing, no terms-of-trade effects, and no labor-leisure choice (i.e., labor supply is fixed). The actual implementation of the model puts together the GAMS software (Brooke, Kendrick, and Meeraus, 1988) to generate all input files including all policy scenarios, and the MPS/GE program solver (Rutherford, 1989) to compute the general equilibrium solutions. Another attractive feature of this implementation is that it easily handles the Systematic Sensitivity Analysis (Harrison, 1990) as described in Section 5 below. Also, the MPS/GE software is designed to greatly ease all standard benchmark procedures (i.e., calibration of all functional parameters).

The model replicates a historical data set as an equilibrium. The 1984 input–output table is the basic data source and the structure of the model comprises the utility function of the representative consumer, government expenditure, investment demand, Armington aggregates of domestic and imported commodities, value-added functions of primary factor inputs labor and capital, and Leontief aggregates of intermediate and value-added components. Only constant elasticity of substitution (CES) and constant elasticity of transformation (CET) aggregators are allowed in the model. The CET aggregator combines domestic sales and exports. Besides interindustry wage distortions, the model takes into account indirect tax distortions, production subsidies, and import tariffs.

The benchmark values of all relevant elasticities were derived from an extensive literature search (Teixeira, 1992). The lack of reliable data on many elasticity parameters is then addressed through extensive parameter perturbation. This exercise is undertaken using a Monte Carlo simulation that randomizes all elasticity parameters independently. The relevant question here is whether or not our reported results are robust to parameter perturbation. As shown in Table 2, it seems that the results do not depend upon particular values of the relevant elasticities. In other words, the point estimate elasticities are not driving the results.

4B. Calibration of Training Costs

Calibration of industry-specific training costs is done in the following way. First, we take the observed pattern of interindustry wage differentials as reflecting optimal responses by firms to different training costs. Then we consider that changes in employment across sectors are a function of relative wages, and are mediated by the training activities of each sector. That is, any worker moving from sector *i*th to sector *j*th will have to go through a training activity in the latter sector before being fully productive. Furthermore, there is no cost sharing in training costs, that is, all costs arising from firm-specific training are entirely borne by the firm.

The relationship between the wage rate in sectors *i*th and *j*th the is obtained assuming that firms minimize wage costs plus training costs. That is, the firm's goal is to find the optimal strategy mix of wages and quit rate such that total costs are minimized, taking into account that the lower the wage, the higher the quit rate, and the higher the quit rate, the higher the training costs. Taking w_0 as the reservation wage, and the quit rate in sector *i*th simply as w_0/w_i, the endogenous wage rate is given by $w_i = \sqrt{\tau_i w_0}$, where τ_i is the constant marginal training cost. The training cost is then calibrated using the reported wage differentials.

Note that under this scenario wage differences are taken to be endogenous, that is, they are a function of industry conditions as well as overall economic conditions. The tightness of labor markets, for instance, affects the worker's quit decision and, hence, the firm's optimal strategy mix of wages and quit rate. If the endogenous reference wage w_0 goes down—if the labor market tightness parameter falls—then w_i also falls and the wage premium, $w_i - w_0$, enjoyed by workers in the *i*th sector will fall too.

Finally, our reservation wage w_0 is the wage in the low-wage/low-training sectors, textiles and clothing, and leather and footwear. These two sectors not only have the highest negative wage differentials, but also they have the largest share of employment in manufacturing (more than 30%).

Table 2: Point Estimate Results and Sensitivity Analysis

Training Costs	Sample	PE	Mean	Median	S.D.	P > PE	50% l.b.	50% u.b.	75% l.b.	75% u.b.
20% (high-wage)	1000	0.6	0.7	0.7	0.1	0.9	0.6	0.8	0.6	0.8
20% (low-wage)	1000	0.0	−0.1	−0.1	0.1	0.8	−0.2	0.0	−0.2	0.0
10%	1000	0.3	0.3	0.3	0.1	0.6	0.3	0.4	0.3	0.5
20%	1000	0.6	0.6	0.6	0.1	0.6	0.5	0.7	0.5	0.7
50%	1000	0.8	0.8	0.8	0.2	0.7	0.7	1.0	0.6	1.1

Notes: Welfare changes are in percentage of GDP. The PE column gives the welfare gains using point estimate elasticities. The three following columns report the mean, median, and standard errors of the sample distribution. P > PE is the probability from the sample distribution that the welfare gain is higher than the point estimate. The remaining columns give the lower and upper bounds of the 50% and 75% symmetric confidence intervals around the median.

5. SUBSIDIZING LABOR MARKETS

The existence of high-wage and low-wage sectors can be interpreted as meaning that there are too many people in "bad" industries and too few in "good" industries. It has been suggested in the literature (e.g., Katz and Summers, 1989a, 1989b) that a direct subsidy to employment in high-wage sectors in an amount just sufficient to offset the wage differences would allow the economy to attain the first-best allocation of labor (that is, uniform wage rates after correction for differences in skills and the attractiveness of the job). Apart from obvious implementation difficulties, the policy may also result in even wider wage dispersion (Katz and Summers 1989a, p. 249), and there is no guarantee that such efficiency-enhancing subsidies will make some workers better off without making others worse off. As Bulow and Summers (1986) have shown, subsidies to high-paid jobs will not produce Pareto improvements if workers in low-paid jobs lack the skills to enter in high-wage/high-productivity industries. In our setting, however, we rule out this event, because workers are fully mobile between sectors through training.

We note that the possibility of a wider wage dispersion in Katz and Summers' (1989) formulation arises from the fact that wage differentials are taken as a nondecreasing function of employment on the grounds that workers' ability to extract rents is increased when the demand for labor is high or because the cost of leaving a job is lower if there is an increase in employment in high-wage industries. This hypothesis of course goes back to Shapiro and Stiglitz (1984), who suggested that firms may have to pay efficiency wages to lessen worker's incentive to shirk. In other works, if it is difficult or costly to monitor a worker's effort, then it may be rational for firms to pay premium wages, that is, wages higher than the "going wage."

In the formulation presented here, a firm that faces relatively higher training costs, and hence, higher costs from labor turnover, will also find optimal to pay premium wages. However, if employment in high-wage sectors increases, the wage gap is expected to be narrower rather than wider because the relative wage in low-training incidence sectors (i.e., the reservation wage w_0) tends to increase. The crucial factor is that wage differentials across industries are based on labor turnover rather than on worker's ability to shirk, and hence, we are not forced to make any restrictions on the behavior of wage differentials.

Our policy exercise consists of successively reducing the training costs borne by firms in their production processes by 10, 20, and 50 percent of the benchmark levels. Table 2, column 3 (PE), presents the points estimate results of this experiment in terms of welfare gains. For simplicity, these reductions—achieved, say, by means of a nationwide training program—are assumed not to consume real resources. Funding of these training programs may, of course, be an issue, and a thorough analysis should have taken into account the fact that either government financing through a higher budget deficit or unilateral capital transfers from, for example, the European Union, have a sizable impact on the Portuguese economy beyond the direct effect of cost reductions on firms's labor demand.

The welfare effects of the reduction of training costs can be very substantial as shown by the 0.6 percent gain in GDP when training costs are 80 percent of the initial level. A 50 percent reduction implies a welfare gain of almost 0.8 percent. Given that there is uncertainty around elasticity parameters, to report point estimate results rather than histograms of frequency or confidence intervals for the endogenous variables may be misleading. In Table 2, we present the results of the sensitivity analysis. The welfare gains using point estimate elasticities are virtually identical to the mean (and median) of a sample distribution drawn from a systematic sensitivity analysis (Monte Carlo simulation) that randomizes all elasticity parameters independently according to previously specified distributions.[1] This is true for all scenarios under consideration.

Interestingly enough, in all three across-the-board reductions in training costs (10, 20, and 50%), high-wage sectors increase their share of total employment relative to the benchmark level, high (low) wage sectors being defined as industries where workers' average pay is higher (lower) than the pay of the average employee (adjusted for skill mix). Labor demand in high-wage sectors increases by (weighted averages) 2.4, 4.5, and 9.7 percent, in the 10, 20, and 50 percent cost reduction cases, while in low-wage sectors the increase in clearly lower: 0.2, 0.3, and 0.6 percent, respectively. Labor demand in the reference sectors (textiles and clothing and leather and footwear) falls by 20.7, 36.6 and 65.5 percent, which means that the economy has decisively moved towards the first-best allocation of labor.

The last two scenarios—20 percent (high-wage) and 20 percent (low-wage)—illustrate the cases where training subsidies are alternatively direct to high-wage sectors and low-wage sectors with a 20 percent reduction in training costs. As Table 3 shows, because labor subsidies to low-training incidence sectors shift labor into low-wage industries—employment in high-wage sectors in the 20 percent (low-wage) case falls by 1.3 percent—the welfare gains when labor subsidies go to low-wage sectors are a wash. Moreover, there seems no cause for concern with an "antiegalitarian" policy of subsidizing those who are already better off. In fact, the wage dispersion increases when subsidies are directed to "bad" jobs and decreases when they go to "good" jobs. Specifically, in the former, the wage rate in high-wage sectors increases by 3.7 percent, while it decreases by 7.2 percent in low-wage sectors. Conversely, a training policy directed to high-wage industries implies a 10.1 percent and −1.5 percent change in the wage rate in low- and high-wage industries, respectively. This narrower wage gap

[1] In the sensitivity exercise, the elasticities of substitution are allowed to take the following equiprobable values: (a) utility function: 0, 0.5, 1.0, 1.5, and 2.0; the point estimate (benchmark) elasticity is 1.0; (b) top level Armington aggregate: 0.5, 0.75, 1.0, 1.25, and 1.5 of the point estimate; (c) top level production function (Leontief aggregate): 0, 0.5, and 1; the point estimate is 0. The elasticity of substitution between capital and labor in the value-added function and the elasticity of transformation between domestic sales and exports follow a normal distribution and can take five equiprobable values, given the standard errors of the respective estimates. Full reference of this procedure can be found in Harrison (1990) and Teixeira (1992).

Table 3: Labor Subsidies and Employment (Percentage Changes). Scenario: 20% Training Cost Reduction in Low-Wage Sectors

	(% Change)		**(% Change)**
High-wage sectors			
REF	−1.1	WOO	−1.1
EGW	−3.2	TRD	−2.0
FNF	−0.3	INL	−3.6
ONM	−1.4	MAT	−14.1
CMA	−1.1	AXT	−8.1
CHM	−0.7	COM	−3.3
FAB	−1.2	BNK	−3.5
MAC	−1.2	REN	−5.2
ELM	−1.8	BSE	−4.6
VEH	−3.0	PUB	−0.2
Low-wage sectors			
AGR	8.1	PAP	21.7
FOR	11.6	RUB	5.6
FIS	5.0	OMP	14.4
MEA	6.2	CON	4.3
MLK	5.8	REP	12.9
CEP	6.6	RES	10.0
OFP	7.5	MSE	24.8
BEV	11.5	MSH	24.9
TOB	9.7	OMS	14.4

between "good" and "bad" jobs is still reinforced by an increase of 20.4 and 7.7 percent—20 percent (high-wage) and 20 percent (low-wage) cases, respectively—in the reservation wage (i.e., the wage of textiles and clothing and leather and footwear workers). In turn, if subsidies are directed to "good" jobs, employment in high-wage industries increases by 6.2 percent, while it decreases by 1.9 and 31.5 percent in low-wage sectors and in the reference sectors, respectively. According to our maintained hypothesis of constant marginal training costs, it seems, therefore, that the fear of increasing "unfairness" in labor markets due to the subsidization of labor in high-wage/high-productivity sectors is unfounded, and there is no reason to anticipate increasing wage dispersion.

6. CONCLUSION

We have tested, in a general equilibrium framework, a policy exercise aimed to pull labor away from low-wage industries towards high-wage industries. It seems that if turnover costs are assumed to explain the observed pattern of industry wage differences, then a policy that subsidizes "good" jobs—namely, the training costs borne by firms in high-wage industries—can produce substantial welfare gains. Moreover, we found that (1) if the same resources are instead allocated to labor in "bad" jobs (low-wage industries), the welfare gains are a wash or even negative; and (2) even if the subsidies are given to those sectors of the labor market in which workers are already better off, the wage differential between low-paid workers and high-paid workers is actually reduced. Enthusiasm for this type of policy must, however, be tempered by the difficulties of implementing structural policies.

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