Outsourcing, Unemployment and Welfare Policy

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Abstract

Outsourcing of labor intensive activities challenges the welfare state and undermines the protection of low-skilled workers. The stylized facts are that profits are concentrated among the high-skilled, involuntary unemployment is mostly among the low-skilled, and private unemployment insurance is missing. This paper analyzes the effectiveness of redistribution and insurance policies when heterogeneous firms can outsource labor intensive components to low-wage economies. The main results are: (i) Social insurance props up wages, leading to more outsourcing and unskilled unemployment. (ii) Redistribution from the skilled to the working poor acts as a wage subsidy to unskilled workers, thereby reducing gross wages, outsourcing and unemployment. (iii) A trend to outsourcing, induced by lower transport costs of imported components, depresses low-skilled wages, raises unemployment, and boosts profits. The resulting polarization of society and the increased income risk of unskilled workers emphasize the social gains from redistribution and insurance and thus call for a more active role of the welfare state in more open economies.

Keywords

Outsourcing, unemployment, social insurance, redistribution

JEL Classification

F23, H21, J64, J65, L23

1 Introduction

The last decades have seen a secular increase in foreign direct investment and outsourcing. As international integration proceeds, large firms find it increasingly easy to outsource the production of labor intensive components or even relocate the manufacturing of final products. These developments are especially pronounced in small European countries; in the Netherlands, Denmark, and Sweden, the value of goods outsourced abroad as a share of domestic demand was close to 50% in 2000, and it even approached 60% in Belgium and Austria (OECD, 2007b). An important motivation of these activities is to exploit substantial cost advantages of production in low-wage economies. In recent years, falling administrative barriers have allowed an ever larger range of firms to benefit from low-cost production abroad. This is clearly reflected in the data: The share of imported intermediates in OECD countries originating from non-OECD countries almost doubled from around 18% in 1992 to 33% in 2004 (Molnar, Pain, and Taglioni, 2007). In several European states, around 10% of total inputs consisted of imports from low-wage countries in 2000 (Falk and Wolfmayr, 2005). As these inputs are typically intensive in unskilled labor, the loss of jobs in Europe primarily hits unskilled workers who already face very high unemployment rates. Empirical studies indeed show that employment rates have been adversely affected by outsourcing to low-wage countries.[1]

Globalization is a formidable challenge to Europe's already strained welfare states. Integration undoubtedly generates substantial gains on average. The benefits and costs, however, tend to be unevenly distributed. The upper income groups benefit not only from higher wages. They also receive the lion's share of rising firm profits since ownership is concentrated at the top. Unskilled workers, in contrast, cannot benefit from higher profits since their share in profit income is insignificant. Instead, they confront lower wages

[1] See for instance Anderton and Brenton (2006) and Hijzen, Görg, and Hine (2005) for the UK, Strauss-Kahn (2003) for France, Falk and Wolfmayr (2005) for several EU countries, and Feenstra and Hanson (1996a, 1996b) and Harrison and McMillan (2006) for the US. While there are persistent negative effects of outsourcing to low-wage countries on low-skilled employment, high-skilled employment typically benefits. Ekholm and Hakkala (2005) find that a one percentage point increase in offshoring to low-wage countries reduces the demand for workers with secondary education by about 3.5% in Sweden while demand for workers with tertiary education is increased by 5-6%.

and higher unemployment risk when labor intensive production is outsourced to low-wage economies. Countries with flexible labor markets and little employment protection such as the U.S. tend to experience a pronounced decline in low-skilled wages.[2] Other countries with a generous European type welfare state and high replacement incomes are instead confronted with particularly high unemployment. Globalization thus enhances inequality and exacerbates the income risk of low-skilled workers. It thereby creates "more demand" for the basic functions of the welfare state, consisting of redistribution and social insurance.

The stylized facts point to important distributional effects of globalization in high-wage economies. The cost savings from outsourcing boost profits and thereby create gains which mostly accrue to the upper income class. Asset income is much concentrated among top income earners while the low-skilled receive only an insignificant share of profits. For the U.S., based on Surveys of Consumer Finances, Wolff (1998) reports in his Table 2 that more than 90% of financial wealth is held by the top 20% in the wealth distribution over the years 1983-1995.[3] In contrast, the increased labor income risk due to globalization, showing up in lower wages and higher unemployment, tends to be concentrated among unskilled workers. According to OECD (2007a), the average unemployment rate in 2005 among individuals with less than upper secondary education amounts to 12.4% in European OECD countries. People with upper secondary education (tertiary education) face unemployment rates of 6.4% (4.0%) only. In Germany, more than 20% of people without upper secondary education were unemployed, compared to only 5.5% of those with tertiary degrees. In the US as well, the 9% unemployment rate in the lowest skill class is almost four times the rate in the highest skill class.

[2]Most scholars dismiss the notion that the observed decline in low-skilled wages may be due to skill-biased technological change only. See for instance Feenstra and Hanson (1996b).

[3]For net worth, the numbers are consistently above 80%. Mankiw and Zeldes (1991), using data from the Panel Study of Income Dynamics of 1984, find that 72.4% of the sample of U.S. families do not hold any wealth in stocks at all (Table 1). This group holds only 34% of total liquid assets (including stocks). Further, only 11.9% of the families hold equity in excess of $10'000. Burniaux, Dang, Fore, Förster, Mira d'Ercole, and Oxley (1998) show the allocation of income components across different decile groups for a range of OECD countries (Table 3.1). They report that the shares of market income of the three top deciles is above 50% on average, and occasionally above 60%.

Empirical evidence also suggests that generous welfare states have a sizeable effect on wage costs and outsourcing in advanced economies. Estimates of the elasticity of the reservation wage with respect to unemployment benefits range from 0.11-0.17 (Lancaster and Chesher, 1983) to values around 0.4 (Feldstein and Poterba, 1984, Fishe, 1982, van den Berg, 1990). The high benefits in Europe (replacement rates are mostly 60% or more, see Nickell, 1997) thus significantly inflate wages. Díaz-Mora (2005) estimates that a one percent increase in firms' domestic labor cost boosts the volume of outsourcing by 0.3%, and adds to outsourcing at the extensive margin by significantly raising the probability that a firm engages in subcontracting (Díaz-Mora and Triguero-Cano, 2007). Investigating outsourcing of Austrian firms to Eastern Europe, Egger and Egger (2003) find that foreign countries with lower unit labor costs attract more outsourcing. When outsourcing is measured in % of gross production, the elasticity is -0.89.

This paper investigates the role of the welfare state in an open economy when firms can outsource labor intensive components to low-wage countries. Consistent with empirical evidence, outsourcing is driven by two forces. First, globalization implies better access of firms to cheap foreign labor. As developing countries become more open and offer more reliable institutional infrastructure, large companies from industrialized states find it less costly to set up an outsourcing relationship with independent suppliers. Lower transport costs including all administrative barriers of shipping intermediate inputs back home also favor outsourcing. Second, the welfare state tends to prop up wages by improving the fallback option of low-skilled workers. Since outsourcing is driven by the cost advantage of cheap labor abroad, the welfare state adds to unemployment by boosting outsourcing beyond the level that would result from globalization alone.

In line with stylized facts, we assume that labor income risk mainly falls on unskilled workers while firm ownership and profit income are concentrated among top earners. Globalization and the resulting polarization of society is thus bound to create "more demand" for the welfare state. The main policy challenge is then to provide insurance and redistribution without unduly exacerbating the problems that cause the difficulties in the first place. To address the basic functions of the welfare state, i.e. social insurance in the absence of private risk markets and redistribution, we consider two policies: a

linear income tax redistributing from high-skilled to low-skilled workers, and unemployment insurance. The linear income tax in our model is particularly interesting since it mimicks the case of a wage subsidy. The main results of our positive analysis are: (i) Outsourcing, induced by lower transport cost for imported components, depresses wages and raises low-skilled unemployment. (iii) Social insurance, i.e. higher unemployment benefits along with higher contributions, boosts wages and leads to more outsourcing and unemployment. (iii) Redistribution, in contrast, reduces gross wages and thereby contains unskilled unemployment and outsourcing. By reducing taxes on the working poor, the linear income tax acts as a wage subsidy. It allows for higher net and lower gross wages, and thus favors job creation.

Welfare optimal redistribution and insurance policies weigh the gains from social insurance and redistribution against the excess burden of social spending. Our analysis shows that a trend to more outsourcing, caused by a reduction in transport costs, leads to more polarization and employment risk of unskilled workers. It thus raises the social gains from redistribution and insurance, which calls for an expansion of the welfare state. This is consistent with the empirical finding of Rodrik (1998) that high income countries with a larger degree of openness and more exposure to external risk have significantly larger social security and welfare spending. When the aggregate gains from integration are very unevenly distributed, our optimal policy results could be viewed as a "strategy of domestic compensation". Beyond the narrow confines of our model, such a strategy might also be necessary on political economy grounds to assure domestic support for openness and international integration.[4]

The paper connects with three strands of the literature. First, the analysis of outsourcing is inspired by new trade theory emphasizing firm heterogeneity and firm organization, foreign direct investment and outsourcing (Grossman and Helpman, 2002, Melitz, 2003, Helpman, Melitz, and Yeaple, 2004, Helpman, 2006, among others). We model outsourcing in the spirit of Antràs and Helpman (2004) and Antràs (2005) although we abstract from contractual incompleteness which is not essential for the purposes of this paper. We

[4]Razin and Sadka (2005) and Razin, Sadka and Swagel (2002) predict a decline in the welfare state, reflecting political pressures from aging and unskilled immigration. Our paper complements their analysis by considering social insurance when there is low-skilled unemployment.

use a simplified and very tractable version of these models as in Keuschnigg (2006) which relies on heterogeneity of success probabilities instead of factor productivities. Second, the paper draws on the public finance literature emphasizing the redistributive and insurance functions of the welfare state such as Cremer and Pestieau (1996) and Boadway, Leite-Monteiro, Marchand and Pestieau (2003). Different from these authors, we relate the insurance function to unemployment risks as in Chetty (2006), Gruber (1997) and Baily (1978), for example. Also, our analysis extends the literature on linear income taxation by including a model of endogenous wages and unemployment with outsourcing (see Gaube, 2005, on optimal income taxation with endogenous wages, and Guesnerie, 2001, and Spector, 2001, for analyzing income taxation in the context of international trade). Furthermore, as a policy response to globalization, Sinn (2007) and Phelps (2000) argue in favor of wage subsidies to the working poor to enhance participation incentives and employment prospects. The reduction of the tax burden on low-skilled workers as part of our redistributive policy is in this spirit.

Finally, the paper relates to the literature on discrete labor supply emphasizing the participation decision of workers and the role of wage subsidies and earned income tax credits (Immervoll et al., 2007, Blundell, 2006, Eissa, Kleven, and Kreiner, 2004, and Saez, 2002, among others). Our model of search unemployment of low-skilled labor is close to Boone and Bovenberg (2004) who emphasize job search as an extensive margin. Although we have not included endogenous job search, the workers' decision to accept a job offer can be understood as a simple participation decision. We define a participation tax rate equal to the sum of the average tax burden of workers and foregone unemployment benefits. It measures the labor supply distortion on the extensive margin that is associated with the variable number of workers switching from involuntary unemployment to paid work. This distortion shows up as part of the overall efficiency cost of the welfare state.

To state these ideas more rigorously, Section 2 sets up an analytical model. Section 3 works out the comparative statics to analyze how globalization leads to increasing polarization of society and to show how redistribution and insurance policies affect the equilibrium with outsourcing. Section 4 characterizes optimal welfare policies. Section 5 concludes. The Appendix contains detailed calculations and proofs.

2 A Simple Model

The world economy is assumed to consist of a high- and low-wage country, or North and South. The North is endowed with high- and low-skilled labor. Firms supply a homogeneous *numeraire* good in two alternative sectors. Our main focus is on the innovative sector where firms combine high- and low-tech inputs to manufacture the final numeraire good. High-tech inputs need skilled labor, low-tech inputs need unskilled labor. Instead of producing in-house and hiring local labor, firms can reduce costs by outsourcing the low-tech input to the South. To simplify, we assume that the output good can alternatively be produced with a standard, linear technology using only skilled labor. Skilled workers thus have an outside option that guarantees them a fixed wage. Unskilled workers, in constrast, have no such option and are employable only in manufacturing of low-tech inputs. We further assume that the unskilled labor market is subject to skill mismatch and involuntary unemployment. The South is endowed with low-skilled labor only which is employed in a linear production activity with a fixed wage.

2.1 Households

In the North, there is a mass 1 of unskilled and a mass N of skilled agents. All agents are risk averse. In addition to high wages, the skilled population also collects profit income. They hold perfectly diversified portfolios of shares in profitable, innovative firms. Although profits per firm are risky, diversification yields a safe profit income $\bar{\pi} = \Pi/N$ per capita where Π stands for aggregate profits. The high-skilled are thus not exposed to any risk, neither on labor nor on profit income. Given a fixed wage r, they supply a variable amount of labor H which earns an hourly wage $(1-T)\,r$ net of tax. Assuming linearly separable preferences, welfare V_H of skilled agents (index H) is a function of income c_H minus effort costs of work $\varphi(H)$,

$$V_H = \max_H \ \{u(c_H - \varphi(H)), \quad s.t. \quad c_H = (1-T)\,rH + \bar{\pi}\}. \tag{1}$$

Optimal labor supply is determined by $(1-T)\,r = \varphi'(H)$. Income effects are excluded. Given convex increasing effort costs, skilled labor supply increases with the net wage.

Unskilled workers earn no other income than wages or social benefits. They supply one unit of labor, earning a gross wage w, but are subject to unemployment risk. The ex ante probability of being unemployed is $1-e$, equal to the ex post unemployment rate. Since the mass of low-skilled workers is one, e also denotes the employment level, and $1-e$ is the mass of unemployed. Expected utility is

$$V_L = e \cdot u\left(w-\tau\right) + \left(1-e\right) \cdot u\left(b\right). \tag{2}$$

To protect income of unskilled workers, the welfare state pays a benefit b in the event of unemployment. Benefits are financed by contributions of the unskilled if employed, and are possibly cross-subsidized by skilled workers. The total tax per capita of employed workers is τ, reflecting the net tax liability of a linear income tax plus the contribution to the unemployment insurance (UI) scheme. Expected income is $c_L = e\left(w-\tau\right) + \left(1-e\right)b$.

2.2 Firms

2.2.1 Technology

A high-skilled agent can either produce one unit of the high-tech input, or r units of a standard good (numeraire). She must thus be paid a fixed wage of r. A low-skilled worker can only produce one unit of the low-tech input without any other option. Both inputs are combined in the innovative sector to assemble the final output good. We make three important assumptions with respect to the innovative technology. First, production is decreasing returns to scale, due to the presence of a fixed factor, reflecting unique know-how or a limited span of managerial control.[5] We assume that there is a mass one of innovative firms and that each one makes strictly positive profits, reflecting returns to the fixed factor. Firm size is limited and endogenously determined, depending on factor prices. Aggregate output reflects the number of firms as well as firm size.

[5] This assumption goes back to Lucas (1978), where he draws an explicit distinction between a firm's production technology and its managerial or entrepreneurial technology. The former typically features constant returns to scale, while the latter exhibits decreasing returns to scale, thus capturing the manager's above average talent to generate profits.

Second, innovative firms can choose among two alternative organizational forms. An *integrated firm* produces low- and high-tech inputs in-house, paying wages r and w. Alternatively, production of low-tech inputs is *outsourced* to independent suppliers in the South.[6] Due to lower wages, outsourcing would dominate integration if there were no other costs. However, the parent firm must first find a suitable, independent subcontractor, transfer the precise technological specifications of the required input and possibly assist in preparing production. Hence, outsourcing is possible only when incurring an extra fixed cost f^o. Apart from this, outsourcing also adds costs of shipping the inputs back home. Both these costs are absent under integration.

Third, we assume that output of the innovative technology is stochastic. Setting up a firm requires a fixed investment with a variable success probability. The fixed cost differs according to organizational mode. The success of the firm becomes known only after the fixed cost is sunk. Investment succeeds with probability $q' \in [0,1]$ and fails with $1-q'$, with probabilities varying across firms. The cumulative distribution of success probabilities among all firms is $G(q) = \int_0^q g(q')\,dq'$. Firms are thus heterogeneous with respect to success probabilities but are symmetric in most other aspects. In particular, all firms that survive to production stage and have chosen the same organizational form are fully symmetric. Ex post, after success is known, there are only two types, integrated and outsourcing firms. Except where absolutely necessary, we suppress the firm index q'.[7]

The organization of production follows a logical sequence of events. (i) A mass one of firms is started, each drawing a success probability q'.[8] (ii) Firms choose an organizational

[6] Our model of outsourcing is much inspired by Antràs (2005) and Antràs and Helpman (2004). However, we abstract from contractual problems. Although such frictions could easily be introduced, they play no role for our arguments and would only add another distortion. We also eliminate product differentiation and monopolistic competition and thereby avoid the additional output market distortions which would further complicate welfare analysis.

[7] Varying success probabilities replaces the variation in factor productivities in the literature inspired by Melitz (2003). In our model, all firms are symmetric within each group which is a *major* simplification compared to Melitz-style heterogeneous firm models. The drawback is that we cannot make statements how the changing composition of the business sector might affect aggregate factor productivity. However, this seems not essential for the policy issues analyzed in this paper.

[8] We do not consider endogenous entry (see eq. 11 in Antràs and Helpman, 2004, where entry results

form and invest a corresponding fixed cost $f^i = 0$ for vertical integration and $f^o > 0$ for outsourcing. (iii) After fixed costs are sunk, the preparation of production succeeds or fails with probabilities q' and $1 - q'$. When firms fail to reach production stage, profits are zero. They incur no further costs and earn no revenues. (iv) If successful, integrated firms hire labor in the North, outsourcing firms purchase the low-tech input from Southern suppliers. Finally, output is produced and consumed. The model is solved backwards.

At production stage, a successful firm acquires high- and low-tech inputs, h and l, to produce raw value added y which is transformed into final output subject to decreasing returns to scale. The total technology is homothetic,

$$x = F(h,l) = f(y(h,l)), \quad f(y) = A \cdot y^{\delta}, \quad y = h^{1-\alpha} l^{\alpha}, \quad 0 < \alpha, \delta < 1. \tag{3}$$

Since value added is linear homogeneous, we can derive cost per unit of value added $\omega(r, W)$ which depends on factor prices but not on scale. The wage cost W per unit of low-skilled labor not only includes the wage paid to workers but also the cost of recruitment on a search labor market. Profit maximization $\pi(\omega) = \max_y x - \omega y$ s.t. $x = f(y)$ gives

$$f'(y) = \omega, \quad \omega(r,W) = \min_{\tilde{h},\tilde{l}} r\tilde{h} + W\tilde{l} \quad s.t. \quad \tilde{h}^{1-\alpha}\tilde{l}^{\alpha} \geq 1. \tag{4}$$

Value added y and output x, and thus the scale of the firm, depend on unit factor cost. Multiplying by y gives $\omega y = y f'(y) = \delta x$ since the output elasticity δ is constant by assumption. Total profits are thus proportional to sales, $\pi = x - \omega y = (1 - \delta) x$.[9] Total factor demand is unit demand scaled by value added output, $h = \tilde{h} y$ and $l = \tilde{l} y$, giving total cost $\omega y = rh + Wl$. The Cobb Douglas technology implies constant cost shares, $Wl = \alpha \cdot \delta x$ and $rh = (1 - \alpha) \cdot \delta x$.

2.2.2 Vertical Integration

Integrated firms produce the low-tech input in-house by hiring unskilled workers locally. The labor market is assumed to be subject to search frictions reflecting skill mismatch.

from innovation and R&D decisions) but take the range of ideas for innovative firms as given.

[9] The profit margin arising from the presence of a fixed factor is very similar to the margin that arises from monopolistic competition in differentiated goods markets.

When hiring, firms must first post a sufficient number of vacancies. To maintain a vacancy costs κ units of the output good. Depending on market tightness, firms locate suitable workers only with probability m per vacancy. A firm announcing k vacancies successfully hires $l = mk$ workers. Once a suitably qualified worker is found, there is a rent to be shared since both parties would find it costly to break up the relationship. The firm and the worker in every match bargain over a wage to share the job surplus. For simplicity, we assume one shot matching so that no other search opportunity is available. If they did not agree on a wage, they would be left with their outside options only.[10] When a wage is agreed upon, production occurs and revenues are shared.

The firm needs h units of skilled labor and l units of unskilled labor. Anticipating the result of wage bargaining, it generates profits of

$$\pi = \max_{h,k} x - rh - wl - \kappa k, \quad s.t. \quad l = m \cdot k, \quad x = F(h, l). \tag{5}$$

The firm's hiring results in the following job creation conditions,

$$(F_l - w) \cdot m = \kappa, \quad F_h = r. \tag{6}$$

Hiring of skilled workers is assumed to be without frictions and occurs until the marginal product is equal to the competitive wage. With unskilled workers, the marginal cost of investing in a job vacancy must correspond to the expected job rent to be earned. Rearranging shows that the total factor cost of an unskilled worker, $F_l = w + \kappa/m \equiv W$, exceeds the wage rate by a recruitment cost which is equal to the search cost per vacancy times the number of vacancies needed for a successful hire.

Given a wage w, the firm can thus earn a job rent of $F_l - w$ if it finds a suitable worker, which happens with probability m ex ante. By accepting a job in a given firm, the worker can move out of unemployment and thereby increase her income by $w - \tau - b$, see (2). The firm and worker bargain over the wage w to maximize their own surplus. Given the workers' bargaining power γ, Nash bargaining $\max_w [u(w - \tau) - u(b)]^{\gamma} [F_l - w]^{1-\gamma}$ results in the following condition determining the optimal wage,

$$(1 - \gamma) [u(w - \tau) - u(b)] = \gamma u'(w - \tau) (F_l - w). \tag{7}$$

[10] Other papers modelling one-shot matching include Acemoglu and Shimer (1999, 2000).

Only integrated firms hire on the Northern labor market, and all of them are identical when they survive to production stage. Therefore, the wage is uniform in symmetric equilibrium so that workers have no income risk depending on *where* they work. Income risk exclusively reflects involuntary unemployment. Under risk-neutrality ($u(y) = y$), each side would secure a share of the joint surplus equal to the respective bargaining power, $w - \tau - b = \gamma(F_l - \tau - b)$ and $F_l - w = (1-\gamma)(F_l - \tau - b)$. Largely the same logic applies with risk-aversion. We get the same equations when using the approximation $u(b) \approx u(w-\tau) + u'(w-\tau)(b-(w-\tau))$ in (7).

2.2.3 Outsourcing

Production of labor intensive components can be outsourced to a low-wage economy. The South is endowed only with low-skilled labor. We further assume, for simplicity, that labor markets in the South are frictionless. Producers have no access to innovative production methods and therefore rely exclusively on linear, Ricardian technologies. A worker can either produce w^s units of the standard good or one unit of the low-tech input which is needed to assemble final output goods in the North. Due to perfect mobility across sectors, she must be paid a fixed wage w^s. The low-tech input can thus be produced much cheaper in the South. With perfect competition, Southern producers must earn w^s per unit to break even. However, shipping back the components to the Northern manufacturer incurs additional transport costs. The subcontractor must thus produce λl^s, $\lambda > 1$, if the manufacturer needs a quantity l^s. The part $(\lambda - 1) l^s$ is lost in cross border transport. The zero profit price for outsourced components is therefore $\lambda w^s < w$.

An innovative firm in the North employs skilled labor to produce the high-tech input in-house. Combining with imports of low-tech inputs, it then assembles the final output good and earns a profit

$$\pi^o = \max_{h^o, l^s} x^o - r h^o - \lambda w^s l^s, \quad s.t. \quad x^o = F(h^o, l^s). \tag{8}$$

The optimal choice of inputs satisfies

$$F_h^o = r, \quad F_l^o = \lambda w^s. \tag{9}$$

Replacing the factor price W by λw^s in (3) and (4), we obtain the unit cost $\omega^o(r, \lambda w^s)$ under outsourcing, yielding value added y^o, output x^o and profit $\pi^o = (1-\delta)x^o$. The Cobb Douglas technology implies constant cost shares so that $\lambda w^s l^s = \alpha \cdot \delta x^o$.

2.2.4 Organizational Choice

Given low wages in the South, $\lambda w^s < W$, profits under outsourcing are larger once the fixed cost f^o has been sunk. The presence of a fixed cost of establishing the oursourcing relationship requires that firms choosing outsourcing be larger and more profitable. It is a stylized empirical fact that outsourcing is an option only for the most advanced and largest companies. At the beginning, before the fixed cost is sunk, a firm draws a success probability $q' \in [0,1]$. Among the two alternatives, a firm chooses the organizational form which yields the highest expected present value net of fixed costs. Outsourcing is preferred to integration whenever $q'\pi^o - f^o > q'\pi$, i.e. when the expected profit differential exceeds the fixed cost of outsourcing, $q'(\pi^o - \pi) > f^o$. The critical firm is thus identified by

$$q \cdot (\pi^o - \pi) = f^o. \tag{10}$$

Firms with high success probabilities $q' > q$ find it profitable to incur the fixed cost and opt for outsourcing. The least successful ones stay integrated. Figure 1 illustrates.

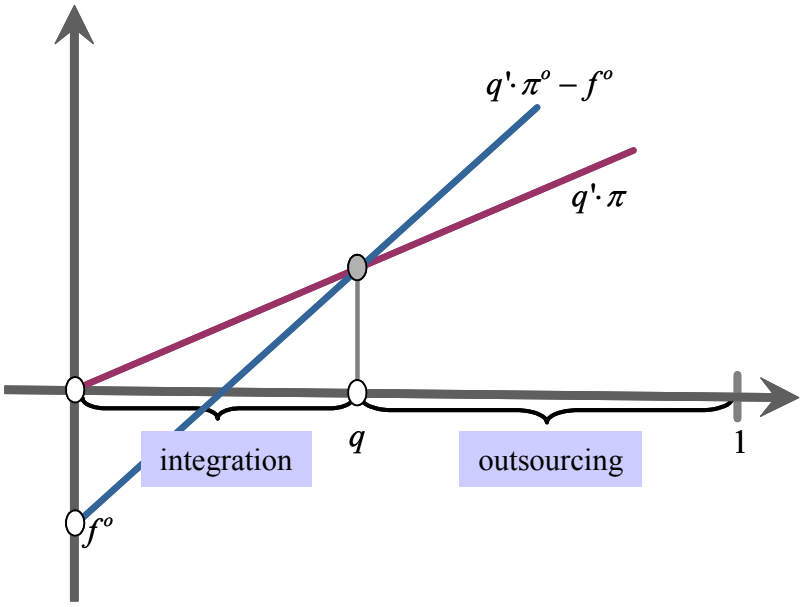

Figure 1: Integration vs. Outsourcing

Firms in the innovative sector are independently distributed with density $g(q')$, giving rise to a cumulative distribution $G(q')$. After the fixed cost is sunk and organizational form is chosen, firms learn their success. A fraction q' of each type is successful and starts production, the remaining part exits. The critical type in (10) determines firm composition by organizational form as illustrated in Figure 1. The shares of integrating and outsourcing firms are

$$s = \int_0^q q' dG(q'), \quad s^o = \int_q^1 q' dG(q'), \quad s^f = \int_q^1 dG(q'). \tag{11}$$

The total mass of all firms is $G(1) = 1$. Since firms of type q' fail at a rate of $1 - q'$, only a fraction $s + s^o < 1$ of all firms survives to production stage. A share $1 - s - s^o$ fails after fixed costs are sunk. Types $q' \in [q, 1]$ choose outsourcing, which is a share s^f of all newly created firms, but only a share $s^o < s^f$ actually makes it to production stage.

After success is realized, there are only two types of firms left in the innovative sector: vertically integrated firms and outsourcing firms. Given this symmetry, total profits in the innovative sector amount to

$$\Pi = s\pi + s^o\pi^o - s^f f^o. \tag{12}$$

2.3 Equilibrium

To close the model, we need to consider the labor market constraint for low-skilled workers and the government budget constraint. Skilled labor supply residually determines the size of the standard sector which uses only skilled labor to produce final output with a linear technology. Trade balances and world output market equilibrium follow from Walras' Law, which is spelled out in Appendix A.

The market for unskilled labor is subject to skill mismatch and search frictions leading to involuntary unemployment in a matching equilibrium. Integrated firms post sk vacancies for unskilled workers. Given a mass 1 of unskilled job searchers, a linear homogeneous matching function determines the employment probabilities e and m,

$$e \cdot 1 = M(1, \theta) = m \cdot \theta, \quad \theta \equiv sk. \tag{13}$$

The variable θ has two interpretations: (i) it is the total mass of vacancies and (ii), since the mass of low-skilled workers is normalized to one, it is also the ratio of vacancies relative to job seekers and reflects market tightness. With hiring per firm equal to $l = mk$, (13) illustrates "market clearing" with job matching, $e = sl$, where total employment sl of firms is equal to employment e of households. Aggregate labor demand reflects employment l per firm, and the number s of (integrated) firms actually hiring locally. In other words, s and l refer to the intensive and extensive margins of labor demand.

With linear homogeneous matching, a tighter market increases workers' chances to get a job but reduces chances of firms to fill vacancies. The matching probabilities satisfy[11]

$$e'(\theta) > 0 > m'(\theta), \quad \hat{e} = (1-\eta)\hat{\theta}, \quad \hat{m} = -\eta\hat{\theta}, \quad \eta \equiv -\frac{\theta m'(\theta)}{m(\theta)} > 0. \tag{14}$$

Adding the government budget constraint in the North closes the model,

$$T \cdot rHN + \tau \cdot e = (1-e) \cdot b. \tag{15}$$

The two exogenous policy instruments are UI benefits b and the tax rate T on the skilled. The net tax τ on employed unskilled workers (working poor) endogenously adjusts to satisfy the fiscal constraint. Changes in the exogenous policy parameters thus reflect the social insurance and redistribution functions of the welfare state: (i) Higher UI benefits are financed by rising contributions of employed workers which adds to their total tax burden. The government thus shifts income in the good state to the bad state and provides gains from insurance to risk averse workers. By assumption, private UI is not available so that social insurance substitutes for missing private markets. Social insurance need not be actuarially fair and might be cross-subsidized by the high-skilled. (ii) The government may redistribute from high-wage earners to the working poor by raising the marginal tax rate T to finance a tax cut or a transfer to unskilled workers. Note that τ indicates the *net tax burden* of the working poor and is the sum of wage income taxes and UI contributions. This scenario corresponds to linear income taxation where the rich are net tax payers and the poor are net beneficiaries.

[11] If we specify an empirically descriptive Cobb Douglas matching function $M = \eta_0 1^{\eta} \theta^{1-\eta}$, where η is the matching elasticity of search, then $\hat{e} = (1-\eta)\hat{\theta}$ and $\hat{m} = -\eta\hat{\theta}$. Except where indicated otherwise, the hat notation denotes percentage changes relative to initial equilibrium values, e.g. $\hat{e} \equiv de/e$.

The redistribution policy via the linear income tax reduces net taxes only in the employed state.[12] It is thus in the spirit of an earned income tax credit or wage subsidy to the working poor which must, of course, be financed out of general tax revenue, mostly by high-wage earners. The main purpose of these subsidies is to boost labor market participation and employment among the low-skilled by widening the income differential between work and unemployment. A small limitation of our model is that the tax cut τ only reduces wages (via bargaining) and thereby works on labor demand and job creation. It does not directly strengthen search incentives which are exogenous in our case. However, the end result is the same: more employment among the low-skilled.

3 Globalization and Welfare Policy

Equilibrium with outsourcing is brought about by values of labor market tightness θ and a tax rate τ on low-skilled workers that simultaneously satisfy the employment constraint $e = sl$ and the government budget (15). This section investigates comparative statics by computing percentage changes relative to an initial equilibrium. We first show how market tightness adjusts to reestablish labor market equilibrium when disturbed by exogenous shocks. Then we compute the necessary change in the tax τ to balance the fiscal constraint. Our ultimate interest is in how economic equilibrium adjusts when transport costs λ fall as a result of globalization, or when the government reconsiders its redistributive or insurance policies by changing the labor income tax rate T or UI benefit b. Detailed computations are found in Appendix B, the main text focusses on economic insights.

3.1 The Labor Market

The impact of public policy and other economic shocks on labor market equilibrium is illustrated in Figure 2. To obtain the response in aggregate labor demand $L = s \cdot l$, we

[12] Strictly speaking, the tax liability under a linear income tax would be $\tau = T \cdot w - z$. Since intensive labor supply of the unskilled is assumed exogenous, we do not need to distinguish between average and marginal tax rates. Only the total tax burden τ is relevant for employment of the low-skilled.

consider the change in demand per firm and in the number of firms hiring at home. With outsourcing, labor demand thus adjusts both on the extensive and intensive margins. Demand will be confronted with household employment resulting from job search to find the equilibrium value of labor market tightness.

The effect of market tightness on labor demand importantly stems from its impact on wages and job rents which determine firms' incentives for job creation. When the market gets very tight, the firms' probability of successfully filling a vacancy and thus earning the job rent becomes smaller. When bargaining, workers ask for a proportional increase in their own rent so that the gross wage must rise. A higher tax on work and a more generous UI benefit strengthen the worker's bargaining position by raising her reservation wage. Since her bargaining strength assures a strictly positive job surplus, any policy raising the reservation wage inflates gross wages. In other words, taxes and benefits both boost wages and thus get shifted to firms, see (B.2).[13]

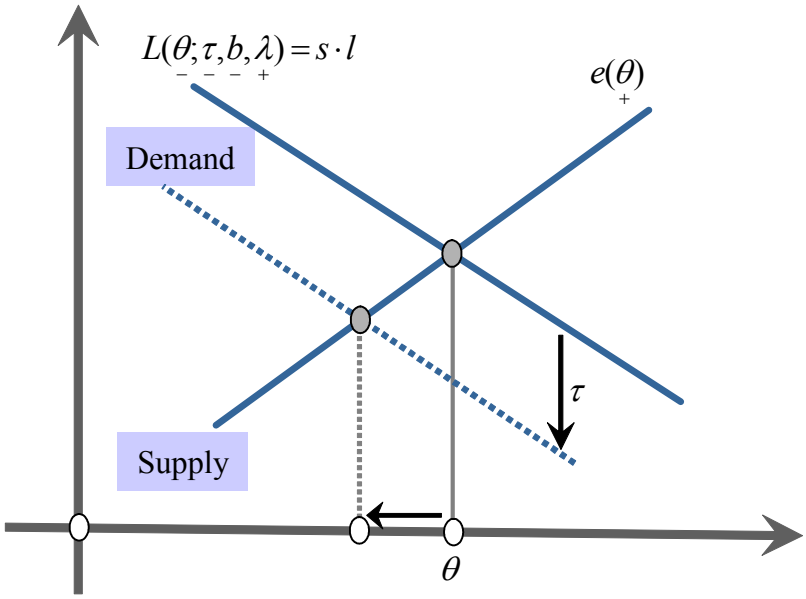

Figure 2: The Low-Skilled Labor Market

In rearranging the job creation condition, we find the unit cost of unskilled labor, $F_l = w + \frac{\kappa}{m} \equiv W$, which reflects not only the wage but also the additional recruitment cost κ/m. Surely, wages will be the lion's share of unit labor costs. In raising wages, benefits

[13] Tax shifting is weakened when benefits are indexed to net wages. Some tax shifting will occur as long as wage indexation of benefits is not complete.

and taxes inflate unit labor costs. Costs also increase with market tightness. When markets become tighter, firms need to post more vacancies and incur higher recruitment costs to successfully hire a given number of workers.

As low-skilled labor cost rises relative to the fixed wage of high-skilled workers, firms will rationalize on the use of unskilled labor. Apart from this substitution effect, a higher cost of unskilled labor feeds through on total factor cost $\omega(r, W)$ per unit of value added. In response, firms scale down their production and demand less of both factors. The substitution and level effects both reduce the demand for unskilled labor per firm. In addition, and with very important implications for organizational choice, the profit per integrated firm falls. To sum up, a market or policy induced increase in unskilled wages erodes profits, output and demand for unskilled labor per integrated firm.[14]

Welfare policy for the unskilled is not relevant for outsourcing firms since they do not hire at home. However, if cross-border transport costs decline, outsourcing to Southern subcontractors and shipping back home will be cheaper. In other words, for any given cost covering producer price w^s in the South, the import price λw^s paid by Northern companies falls. Consequently, unit costs of firms outsourcing to low-wage countries fall, and their sales and profits rise. Appendix equations (B.4-B.5) sum up.

Relative profits under integration and outsourcing determine the extensive margin of labor demand. When domestic welfare policy boosts wages, the profit π of an integrated firm declines. With outsourcing becoming a relatively more profitable strategy, more firms will choose to do so. In Figure 1, the line through the origin rotates down so that a margin of firms with a lower success probability switches to outsourcing. Fewer firms remain integrated and continue to hire at home. Labor demand on the extensive margin, $s = \int_0^q q' dG(q')$, must decline. Similarly, a reduction in transport costs of shipping outsourced components back home makes outsourcing more profitable and also erodes extensive demand for unskilled labor at home.

The characterization of the demand curve in Figure 2 is now complete. Increasing

[14] The demand for high-skilled labor per firm might be ambiguous due to offsetting level and substitution effects. However, our analysis is greatly simplified by the assumption that high-skilled labor is residually employed in the standard sector without any feedback effect on the low-skilled labor market.

market tightness, a higher tax load on employed workers, and more generous UI benefits inflate the unit wage cost of unskilled workers and reduce employment per firm. Higher wage costs cut into profits of domestically hiring firms and induce more outsourcing which further reduces labor demand. A lower transport cost (λ *declines* in Figure 2) also makes outsourcing more attractive and shifts down the labor demand curve. The supply schedule $e(\theta)$ is upward sloping. Job seekers find employment more easily when the market is tight. The intersection yields equilibrium market tightness. The analysis of Figure 2 is summarized by the labor market condition $\theta(\tau; b, \lambda)$ in Figure 3. Since a higher tax τ on employed workers shifts down labor demand, equilibrium market tightness declines. Therefore, the labor market condition slopes down in θ, τ-space. The comparative statics of the labor market is formally derived in (B.9).

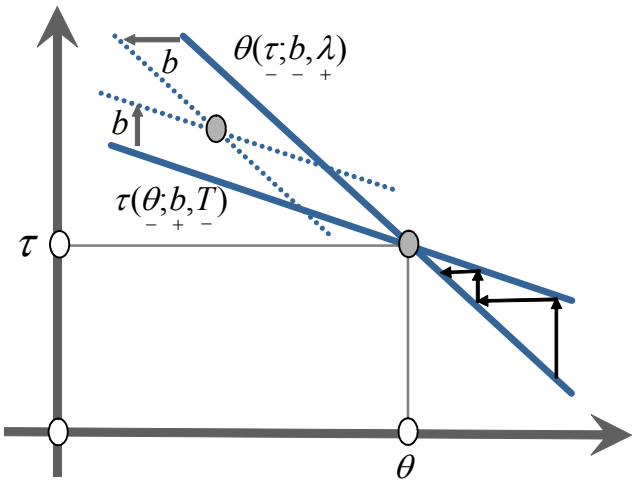

Figure 3: General Equilibrium

3.2 The Fiscal Budget

The tax τ on the working poor is the endogenous variable balancing the fiscal budget. For given market tightness and employment rates, higher UI benefits dictate higher contributions, thereby raising the tax load on employed workers. The budget line in Figure 3 shifts up. Although a higher tax rate T on skilled workers discourages labor supply[15] and

[15] A variation of skilled labor supply residually affects Ricardian output without any feedback on the innovative sector which is entirely tied down by the low-skilled labor resource. This assumption greatly simplifies the analysis without much loss in insight.

erodes the tax base, it raises tax revenue and thereby allows to cut the net tax liability of unskilled workers.[16] The budget line shifts down. Finally, when the labor market becomes tighter, job seekers find employment more easily. Increased employment creates a double fiscal gain which is proportional to the participation tax rate $\tau^* = (\tau + b)/w$. The participation tax consists of taxes paid and benefits lost when switching from joblessness into employment. An increase in market tightness, reflecting firms' demand for more unskilled labor, thereby strengthens the tax base for contributions and saves social spending on UI benefits. The tax per capita of the working poor can be cut which implies the budget line is downward sloping in Figure 3, see also (B.10).

The labor market and the fiscal budget must be in simultaneous equilibrium. Both conditions are negatively sloped in Figure 3. However, to assure stability, the labor market locus must be steeper than the budget line.[17] The intersection of the two conditions determines equilibrium market tightness and the sustainable tax rate on employed unskilled workers. The figure uniquely pins down the comparative statics of exogenous shocks, shown analytically in (B.11). For example, when the government raises UI benefits, the budget line shifts up which indicates the need for higher contributions that further add to the tax burden of unskilled workers. For a given tax rate, the labor market locus shifts to the left as higher benefits boost wages and thus shrink labor demand on both margins. In consequence, the new equilibrium involves a higher tax load, relaxes market tightness and raises unemployment.

3.3 Equilibrium Adjustments

We can now demonstrate more rigorously the results stated in the abstract. The immediate effect of a *reduction* in transport cost is an increase in profits π^o which induces more

[16] At very high tax rates, revenue might decline (Laffer curve effect). However, it would never be an optimal policy to raise the tax rate to a level where this could occur.

[17] The other case would be unstable and give rise to a pathological chain reaction. Suppose there is an increase in market tightness due to an exogenous shock such as an increase in transport cost. With more employment, the tax would be cut. This tax cut would stimulate job creation, induce an even larger increase in market tightness and thereby trigger an explosive cycle. Further, by Samuelson's correspondence principle, the comparative static effects would be opposite to those in the stable case.

firms to switch to outsourcing, thereby eroding labor demand on the extensive margin. For given θ, domestic wages and labor costs are not immediately affected. However, to eliminate excess labor supply, market tightness falls, thus rationing labor supply and encouraging more hiring. The labor market line in Figure 3 thus shifts to the left, indicating a less tight market for any given tax τ on employed low-skilled workers. As employment falls, more people claim UI benefits and fewer pay contributions. Consequently, the tax τ on employed workers must be increased to balance the public budget (given that T does not change). In equation (B.12), we show that globalization not only raises unemployment among the low-skilled but also reduces their wages.[18] In contrast, per capita profit income of the high-skilled increases for two reasons. First, cheaper low-tech imports directly boost profits. Second, since more firms switch to outsourcing, the reduction in labor demand depresses wages, thereby strengthening profits of integrated firms hiring at home. Depending on their weight in the domestic economy, profit income on a diversified portfolio of firms rises. The owners of capital are the winners of globalization.

As globalization tends to polarize advanced societies, governments might want to redistribute on a larger scale by raising the tax rate on high-wage earners to finance a tax cut on the working poor. Accordingly, the budget line in Figure 3 shifts down, leading to a lower tax burden on unskilled workers and increased market tightness. Unemployment among the low-skilled declines. The policy acts like a wage subsidy, allowing for higher net wages and at the same time lower gross wages, see (B.13). A lower wage bill boosts job creation and employment. It also boosts profits of integrated firms and thereby reduces the tendency towards outsourcing. This result points to the usefulness of policies to strengthen labor market participation of the low-skilled in a globalized economy. Finally, although the high-skilled loose on account of a higher marginal tax rate on labor supply, they gain on their profit income.

An central function of the welfare state is social insurance when private risk markets are missing. Our last experiment raises UI benefits and finances them with higher contributions which add to the overall tax burden of the employed. This way, the government

[18] The effect is not entirely unambiguous since the necessary tax increase points in the opposite direction of a higher wage. We give a sufficient condition assuring that the direct effect dominates over the induced tax effect. The condition by the way would also guarantee stability.

allows risk averse workers to shift income from the good to the bad state, creating gains from insurance. In Figure 3, both curves shift since higher benefits ceteris paribus require a higher tax τ, and since higher benefits boost workers' reservation wages and add to firms' wage costs. The policy thereby discourages job creation and raises unemployment among the low-skilled, as is indicated by reduced market tightness. In adding to firms' wage costs, the welfare state reduces profits of integrated firms and thereby induces more outsourcing. Via reduced per capita profits, the high-skilled bear part of the burden.

4 Welfare and Optimality

In this section, we study how public policy affects individual welfare and then turn to optimal policy design.

4.1 Individual Welfare

Skilled workers gain from higher profits but lose when taxes on their labor income rise. Applying the envelope theorem to (1) yields a welfare change $NdV_H = u'_H \cdot \left(-Y_H \hat{T} + d\Pi\right)$ where $Y_H = (1-T)\, rHN$ is net wage income and $\hat{T} = dT/(1-T)$. Adding the profit change in (B.14), and replacing $\hat{e} = (1-\eta)\,\hat{\theta}$ in unit labor cost $W\hat{W} = w\hat{w} + \frac{\kappa}{m}\eta\hat{\theta}$, yields a welfare impact equal to

$$\frac{NdV_H}{u'_H} = -Y_H\hat{T} - ew\hat{w} - \frac{\eta}{1-\eta}\frac{\kappa e}{m}\hat{e} - s^o\lambda w^s l^s \hat{\lambda}. \tag{16}$$

Better access of industrialized countries to cheap labor in the South boosts profits along two lines. First, savings in transport cost directly raise profits of outsourcing firms and, thus, per capita profits of a diversified portfolio. Second, part of the profit gains stem from diminished labor market prospects of unskilled workers. Lower wages reduce the wage bill, and higher unemployment relaxes market tightness and cuts hiring costs of integrated firms. With profits concentrated among high-skilled households, they are thus clearly the winners of globalization, even if their wage remains fixed in our model. In the absence of policy measures, globalization tends to polarize societies in advanced economies.

Welfare in (2) changes by $dV_L = u'_E \cdot ew\,(\hat{w} - \hat{\tau}) + u'_B \cdot (1-e)\,w\hat{b} + [u_E - u_B]\,e\hat{e}$, where lower indices E and B refer to the states 'Employed' and 'on Benefits', and $\hat{\tau} \equiv d\tau/w$ and $\hat{b} \equiv db/w$. Substituting u'_B by the approximation in (B.1) and the square bracket by the bargaining condition (6), with the job rent replaced by the job creation condition $(F_l - w)\,m = \kappa$, yields

$$\frac{dV_L}{u'_E} = ew\,(\hat{w} - \hat{\tau}) + (1-e)\,w\hat{b} + \rho\chi\,(1-e)\,w\hat{b} + \frac{\gamma}{1-\gamma}\frac{\kappa e}{m}\hat{e}, \tag{17}$$

where ρ is the coefficient of relative risk aversion and $\chi = (w - \tau - b)\,/\,(w - \tau)$ measures the income differential between the two employment states. Welfare of unskilled workers partly reflects taxes and transfers. Since the fiscal budget must always balance, we can replace the endogenous tax liability by the budget differential (B.10), after using $\hat{e} = (1-\eta)\,\hat{\theta}$. To compare with the welfare change of the high-skilled, we substitute (16). Collecting terms and using $(F_l - w) = \kappa/m$ and $\hat{H} = -\sigma\hat{T}$ leads to

$$\begin{aligned} \frac{dV_L}{u'_E} &= -\frac{N dV_H}{u'_H} + \frac{T}{1-T}Y_H\hat{H} + ew\Gamma\hat{e} + \rho\chi\,(1-e)\,w\hat{b} - s^o\lambda w^s l^s\hat{\lambda}, \qquad (18)\\ \Gamma &\equiv \tau^* + (\gamma - \eta)\cdot\frac{(F_l - w)\,/w}{(1-\eta)\,(1-\gamma)}. \end{aligned}$$

Dividing through by marginal utilities, we express welfare changes in money equivalent units. The welfare change of unskilled workers reflects redistribution as well as efficiency changes. The first term captures *redistribution* and means that welfare gains of the skilled partly are at the expense of welfare losses of the poor. In our model, the high-skilled lose if they are confronted with a tax increase and if profits decline. Obviously, a tax increase directly redistributes to the poor. Redistribution also occurs since profits going to the skilled and average wage incomes of the low-skilled partly change in opposite ways. Higher wages benefit the unskilled at the cost of lower profits to the skilled. A tighter labor market raises employment and average income of the unskilled but cuts into profits of the skilled due to increased hiring costs per employee.

Consider now the policy induced efficiency changes, corresponding to the aggregate welfare change measured in income units, $d\Omega \equiv \sum_i N_i dV_i/u'_i$. First, a redistribution policy reduces efficiency since it raises the marginal tax rate T and thereby distorts high-skilled labor supply. Expanding low-skilled employment yields efficiency gains proportional to

the term Γ. Part of the gain is proportional to the participation tax rate τ^* in the sense of Saez (2002). When an individual accepts a job offer (which in equilibrium will always be the case) and switches from unemployment into a job, she incurs a total loss in terms of taxes paid and benefits foregone equal to $\tau^* w \equiv \tau + b$. This total loss is the mirror image of the double fiscal gain which swells tax revenues and at the same time saves UI spending. Participation tax rates tend to be quite high for low-income earners in Europe, as Immervoll et al. (2007) have shown. The excess burden of the welfare state from discouraging low-skilled employment could thus be substantial.

The second term in Γ relates to labor market distortions from search frictions. When the bargaining power of workers is too high, compared to the matching elasticity of job search, $\gamma > \eta$, workers get too high wages and thus a too high share of the joint surplus, which causes inefficiently high unemployment. Any employment enhancing policy thereby creates welfare gains on this margin. If the search equilibrium were efficient in the sense of Hosios (1990), $\gamma = \eta$, then there would also be no marginal gain from more employment.

The next term in (18) corresponds to the welfare gains of unskilled workers due to more insurance. Social insurance is valuable for risk averse workers when markets are incomplete and private UI is not available. The gains from insurance are proportional to the unemployment rate times the product of the degree of risk aversion ρ and the degree of income variation $\chi = (w - \tau - b) / (w - \tau)$. This term is known from Baily (1978), Gruber (1998) and Chetty (2006), among others. In these papers, all agents are subject to the same unemployment risk so that there can be no welfare gains from redistribution but only from insurance. Further, our analysis explains how outsourcing and globalization magnifies the unemployment risk of low-skilled workers.

Consider efficient UI in the absence of distributional effects. Given constant transport cost, and abstracting for the moment from high-skilled labor supply in (18), aggregate welfare measured in income units would be $d\Omega = ew\Gamma \cdot \hat{e} + (1 - e)\, w \cdot \rho\chi \cdot \hat{b}$. Optimal UI would raise benefits until efficiency is maximized. If there was no excess burden due to the employment response ($\hat{e} = 0$), the optimal level of insurance would be 100%. Optimality would require $(1 - e)\, w\rho\chi \cdot \hat{b} = 0$ which implies $\chi = 0$, or $w - \tau = b$. However, UI itself leads to more unemployment and thereby imposes efficiency losses. Using $\hat{e} = (1 - \eta)\, \hat{\theta}$

together with (B.11) gives an employment response of $\hat{e} = -\sigma_{E,B}\hat{b}$ with an elasticity of $\sigma_{E,B} \equiv (1-\eta)/(e\Psi)$. Optimal UI from a pure efficiency perspective would thus satisfy $e\Gamma\sigma_{E,B} = (1-e)\rho\chi$ which is structurally identical to the formula in Chetty (2006). Of course, this condition determines efficient UI only implicitly since the coefficients depend on the scale of the UI-scheme. We can conclude, however, that a high excess burden Γ, a large behavioral elasticity $\sigma_{E,B}$ (employment is strongly reduced), low risk-aversion ρ, and a low unemployment risk $1-e$ call for a large value of χ. A large spread $w - \tau > b$ implies little insurance.

The last term in (18) captures the direct efficiency gains from globalization, reflecting the improved access of Northern companies to cheap labor in the South. Lower transport costs λ reduce production costs when outsourcing low-tech inputs to low-wage economies. These savings swell the profit income of high-skilled households, proportional to the share s^o of firms that have chosen outsourcing. While increased outsourcing is a boon to firm owners, it is a problem for unskilled workers. As more firms switch to outsourcing, the extensive margin of labor demand shrinks. When labor markets become less tight, wages are cut and the unemployment rate among the low-skilled increases. In the absence of a policy reaction, the net effect of globalization ($\hat{\lambda} < 0$) on aggregate welfare is $d\Omega = ew\Gamma\hat{e} - s^o\lambda w^s l^s\hat{\lambda}$. It would be clearly positive if the welfare state were absent and labor markets were efficient. In this case, $\tau^* = 0$ and $\gamma = \eta$, implying $\Gamma = 0$. The impact of more outsourcing on the domestic labor market magnifies the welfare gains if the domestic labor market is overly tight, $\gamma < \eta$. In contrast, if unemployment is inefficiently high, $\gamma > \eta$, the net impact tends to be ambiguous. The gains from lower transport costs of low-tech imports would have to be set against the efficiency losses from higher unemployment due to increased outsourcing. These efficiency losses are magnified if there is a high participation tax τ^* due to the existence of a welfare state.

4.2 Optimal Welfare State

The basic functions of the welfare state are redistribution and social insurance. To analyze optimal welfare policy, we need to express welfare changes in final form. Taking account of general equilibrium effects, public policy changes welfare of skilled households as in

(16). Appropriate substitutions of (B.11) and (B.13) yield, after some manipulations,[19]

$$\frac{NdV_H}{u'_H} = -I_T \cdot Y_H \hat{T} - I_B \cdot w\hat{b}, \tag{19}$$

where I_B and I_T are positive coefficients capturing the redistributive effects. To evaluate the welfare change of unskilled workers, it will enhance intuition if the employment response $we\hat{e} = \sigma_{E,T} Y_H \hat{T} - \sigma_{E,B} w\hat{b}$ is expressed in terms of positive elasticities $\sigma_{E,T}$ and $\sigma_{E,B}$.[20] Given the skilled labor supply response $\hat{H} = -\sigma\hat{T}$ and employment elasticities $\sigma_{E,j}$, the welfare change of the unskilled in (18) is

$$\frac{dV_L}{u'_E} = -\frac{NdV_H}{u'_H} - \left[\frac{T}{1-T}\sigma - \sigma_{E,T}\Gamma\right] Y_H \hat{T} + \left[\rho\chi\left(1-e\right) - \sigma_{E,B}\Gamma\right] w\hat{b}. \tag{20}$$

Let the policy goals of redistribution and efficiency be characterized by a social welfare function $\Lambda = NV_H + \xi V_L$ where the weight $\xi \geq 1$ corresponds to the government's willingness to sacrifice utility of high-skilled to raise utility of unskilled agents. Optimal policies for redistribution and social insurance must take account of induced general equilibrium effects. Maximizing social welfare yields a condition for *optimal redistribution* $d\Lambda/\hat{T} = NdV_H/\hat{T} + \xi dV_L/\hat{T} = 0$ or, upon using the results above,

$$\frac{\xi u'_E - u'_H}{\xi u'_E} \cdot I_T = \frac{T}{1-T} \cdot \sigma - \Gamma \cdot \sigma_{E,T}. \tag{21}$$

The interpretation is intuitive. The left-hand side represents the gains from distribution when the government redistributes an amount I_T from rich people with low marginal utility of income to the working poor with high marginal utility. Due to the income difference, $u'_E > u'_H$. The gains are larger if the government weighs welfare of the poor relatively more. The right-hand side expresses the marginal excess burden associated with redistribution. Our scenario mimicks the case of a linear income tax where the rich are net tax payers and the poor are net beneficiaries of redistribution. However, there is one big difference to the standard linear income tax literature: the unskilled poor may be employed or unemployed. Their labor market behavior reflects a discrete participation

[19] Use $I_B \equiv \frac{1-\eta}{\Psi}\frac{W}{wL_W}$ and $I_T\Psi \equiv \frac{1-\tau^*}{1+\rho\chi}\eta - (1-\eta)\,\tau^* + \frac{\kappa}{m}\frac{\eta}{w} + \frac{T}{1-T}\sigma\frac{(1-\eta)W}{wL_W}$ for short notation. The first two terms in I_T are positive by the assumption noted in (B.12).

[20] Use $\hat{e} = (1-\eta)\,\hat{\theta}$ and (B.11) to get $\sigma_{E,T} \equiv \left[1 - \frac{T}{1-T}\sigma\right](1-\eta)/\Psi > 0$ and $\sigma_{E,B} \equiv (1-\eta)/\Psi > 0$.

decision and not a continuous hours decision. Note also that a linear income tax redistributes between groups of active workers, leaving unemployment compensation unchanged. Therefore, raising T creates a standard excess burden $\frac{T}{1-T} \cdot \sigma$ due to variable labor supply of the skilled. In refunding the extra revenue to cut the tax τ on the working poor, or even pay a subsidy to them, the government boosts net of tax wages $w - \tau$. At the same time, the policy lowers gross wages w. By augmenting job rents in the business sector, this latter effect induces job creation and employment. Therefore, the policy *reduces* the excess burden from the employment distortion of low-skilled workers, as measured by the participation tax rate $\tau^* = (\tau + b)/w$ which is part of Γ.

The condition for *optimal insurance* is $d\Lambda/\hat{b} = NdV_H/\hat{b} + \xi dV_L/\hat{b} = 0$ or,

$$\rho\chi\,(1-e) + \frac{\xi u'_E - u'_H}{\xi u'_E} \cdot I_B = \Gamma \cdot \sigma_{E,B}. \tag{22}$$

To provide social insurance to risk averse workers, the government raises taxes (UI contributions) of the employed to pay higher UI benefits to the unemployed, thereby shifting income from the good to the bad state. The first term reflects the gains from insurance when private UI markets are missing. Further, when benefits are raised, welfare of low-skilled workers increases at the expense of the high-skilled due to the distributive term I_B. UI benefits lead to higher wages and lower profits. The second term reflects these gains from redistribution. The right hand side shows the excess burden. It reflects the fiscal cost τ^* when more agents switch from employment into joblessness when benefits increase. Starting from small values, the excess burden is zero (in the absence of search distortions when $\eta = \gamma$) while the welfare gains from insurance and redistribution are strictly positive to the first order. Eventually, however, the progressively increasing excess burden dominates the gains from insurance. The condition is consistent with the existing literature on optimal UI, except that in our model with high- and low-skilled households, one must additionally take account of redistributive effects captured in I_B.[21]

[21] The last two equations can be rearranged to yield

$$\frac{u'_H}{u'_E}\frac{1}{1-\left(\frac{T}{1-T}\sigma - \Gamma\sigma_{E,T}\right)/I_T} = \xi = \frac{u'_H}{u'_E}\frac{1}{1-\left[\Gamma\sigma_{E,B} - \rho\chi\,(1-e)\right]/I_B},$$

which illustrates the choice on the welfare frontier in V_L, V_H-space. The government uses each policy

How does a reduction in transport cost, leading to increased outsourcing, affect the optimal structure of the welfare state? Section 3 and Appendix B have shown that this globalization shock leads to a higher unemployment rate $1-e$ among low-skilled workers, thereby requiring a higher contribution tax τ by the employed. In addition, outsourcing reduces gross wages w so that unskilled workers loose. Not only is expected income $c_L = e(w-\tau) + (1-e)b$ clearly eroded, workers are also exposed to higher unemployment risk. Given the observed wealth and profit concentration, the high-skilled are clearly the winners of globalization. All firms in the manufacturing sector report larger profits, reflecting cost savings for low-tech inputs: lower import costs of outsourcing firms and lower wage costs of domestically hiring firms. In the absence of an active policy intervention (b and T constant), welfare of the high-skilled clearly increases while welfare of unskilled workers is reduced on all fronts, see (16-17). The trend to outsourcing leads to a more polarized society and to larger employment risk of unskilled workers.

Outsourcing increases the "demand" for the basic functions of the welfare state, social insurance when private risk markets are missing, and redistribution. This demand shows up in the optimal policy formulas (21-22) by larger gains from redistribution ($\xi u'_E - u'_H$ increases) and larger gains from social insurance (the unemployment rate $1-e$ increases). Although we cannot rigorously prove it, we conclude that the optimal policy response to globalization is to expand the role of the welfare state, leading to more redistribution and social insurance.[22] Since the tax scheme redistributes towards the working poor, it reduces the participation tax τ^* and lowers the employment distortion. The redistribution scheme acts as a wage subsidy to the working poor by lowering their net tax. In cutting the participation tax, redistribution makes insurance less damaging. Nevertheless, it might not be possible to restore unskilled workers to their original welfare position.

to the extent that the social marginal rate of substitution ξ (slope of the social indifference curve) is equal to the respective social marginal rate of transformation of high-skilled into low-skilled welfare, $SMRT = -NdV_H/dV_L$. These rates depend on the *net* efficiency costs in the denominator, net of gains from insurance $\rho\chi(1-e)$ and net of the efficiency gain from strengthening low-skilled participation.

[22] It seems impossible to derive comparative static results on the optimal policy formulas. However, our conclusion is supported by illustrative simulations of a calibrated version of the model. We have not been able to generate a counterexample to these statements.

5 Conclusions

The recent trend to outsourcing of labor intensive components puts pressure on the welfare states in advanced economies. Large companies are searching for ways to access cheap labor in low-wage economies to cut production costs. Based on a simple model of outsourcing and involuntary unemployment, we have shown how international integration, by lowering transport costs of intermediate imports, facilitates outsourcing and impairs employment prospects and wages of unskilled workers while at the same time swelling the profits of top income earners. The resulting polarization of society and the increased income risk of unskilled workers seemingly emphasize the basic functions of the welfare state, redistribution and social insurance.

The need for an expanded role of the welfare state in the presence of increased globalization pressures arises despite of the fact that the welfare state itself is surely part of the problem that it is designed to solve in the first place. Offering higher replacement incomes to provide more insurance to risk averse workers boosts wages and causes higher unemployment. By inducing even more outsourcing than would otherwise obtain in the global economy, the impact of social insurance on unemployment of low-skilled workers is reinforced. These detrimental effects show up as part of the efficiency costs arising from welfare policies. However, expanding a linear income tax schedule to redistribute more heavily from skilled to unskilled households might involve a smaller efficiency cost than is commonly perceived. Since the income tax redistributes only to the working poor, i.e. to unskilled households earning an active wage income, it cuts the participation tax on unskilled workers and widens the income gap between work and joblessness. It thereby acts as a wage subsidy which is often deemed to become more important in advanced welfare states when the integration of the world economy accelerates. In our model, the redistribution in favor of the working poor allows net wages to rise and, at the same time, gross wages to fall. It thereby initiates job creation and reduces unemployment among low-skilled workers. Since lower wage costs for domestic labor adds to profits of firms hiring at home, the policy also helps to stem the tide towards outsourcing.

Appendix

A Output Market Equilibrium

Adding income of the skilled in (1) to average income $c_L \equiv (w-\tau)\,e + b\,(1-e)$ of the low-skilled and imposing the fiscal budget (15) yields national income (GNP)

$$c_L + c_H N = Y \equiv ew + rHN + \Pi. \tag{A.1}$$

GNP consists of earnings rHN and profits Π of skilled and wages we of unskilled workers.

Walras' Law implies that the goods market must clear when resource and budget constraints are fulfilled. Substitute (12), (5) and (8) into (A.1)

$$\begin{aligned} s^o \lambda w^s l^s &= (X + X^r - C) + (e - sl)\,w, \quad X \equiv sx + s^o x^o, \\ C &\equiv c_L + c_H N + \kappa s k + s^f f^o, \quad X^r \equiv r \cdot (HN - sh - s^o h^o)\,. \end{aligned} \tag{A.2}$$

Demand stems from consumer demand, and from business spending on search costs and fixed costs of outsourcing. The standard sector adds output X^r, depending on residual labor supply HN of skilled workers in excess of the skill requirements in innovative production. Labor market clearing implies that the North runs a trade surplus $X + X^r - C$ to pay for imports of components. Their value corresponds to wage costs $s^o \lambda w^s l^s$ in the South when free entry squeezes subcontracting profits to zero.

The South is endowed with unskilled labor and has no access to the innovative technology. It is specialized in standard production with a low, fixed productivity w^s, and in manufacturing low-tech inputs for Northern companies. Per capita utility is equal to consumption, $V^s = u\,(w^s)$. Given a fixed endowment L^s, demand and welfare are $C^s = w^s L^s$ and $V^s = u\,(w^s)\,L^s$, respectively. Market clearing in the South is

$$X^s - C^s = -s^o \lambda w^s l^s, \quad X^s \equiv w^s\,(L^s - s^o \lambda l^s)\,. \tag{A.3}$$

The South runs a trade deficit in goods financed by a trade surplus in low-tech intermediate inputs (corresponding to international factor payments). Adding up (A.2) and (A.3) yields market clearing for the world goods market, $C + C^s = X + X^r + X^s$.

B Comparative Statics

Appendix B log-linearizes the model and derives the comparative static effects of exogenous shocks to λ, T and b on the values of τ and θ satisfying the two conditions of labor market equilibrium $\theta(\tau; b, \lambda)$ and fiscal budget balance $\tau(\theta; b, \lambda)$, as illustrated in Figure 3. In labor market equilibrium, employment by households and firms must be identical, $e = sl$ or $e(\theta) = L(\theta; \tau, b, \lambda)$, which solves for θ as in Figure 2.

B.1 The Labor Market

To obtain the impact on labor demand $L = sl$, we show how a change in market tightness and other variables affects wages, labor costs and profits of firms. The bargaining condition yields the impact on wages. Approximate marginal utility by a Taylor expansion where $\rho \equiv -cu''(c)/u'(c)$ measures relative risk aversion and χ labor income risk. Using lower indices E and B to refer to the states of 'Employment' and 'on Benefits', we use the short-hand $u'_E = u'(w - \tau)$ and $u'_B = u'(b)$ and get

$$u'_B \approx u'_E + u''_E \cdot (b - w + \tau) = u'_E \cdot (1 + \rho\chi), \quad \chi \equiv \frac{w - \tau - b}{w - \tau}. \tag{B.1}$$

Together with $u_E - u_B \approx u'_E \cdot (w - \tau - b)$, we find $d\frac{u_E - u_B}{u'_E} = (1 + \rho\chi)(dw - d\tau - db)$. Substitute job creation $F_l - w = \kappa/m$ into (7) and make use of these approximations as well as $\eta \equiv -\theta m'/m$. Expressing the change in the taxes and benefits relative to the wage rate yields $(1 + \rho\chi) w \left[\hat{w} - \hat{\tau} - \hat{b}\right] = \frac{\gamma}{1-\gamma}\frac{\kappa}{m}\eta\hat{\theta}$. Substituting again the bargaining condition on the right hand side and using $u_E - u_B \approx u'_E \cdot (w - \tau - b)$ yields[23]

$$\hat{w} = \hat{\tau} + \hat{b} + \frac{1 - \tau^*}{1 + \rho\chi} \cdot \eta\hat{\theta}, \quad \tau^* \equiv (\tau + b)/w, \quad \hat{b} \equiv \frac{db}{w}, \quad \hat{\tau} \equiv \frac{d\tau}{w}. \tag{B.2}$$

Wages increase with market tightness, UI benefits and taxes on work.

The marginal product of unskilled labor reflects unit wage costs. Rearranging the job creation condition, $F_l = w + \kappa/m \equiv W$, shows that wage costs reflect not only wages but

[23] Under risk neutrality, $u(c) = c$ and $u'(c) = 1$, implying $w - \tau - b = \frac{\gamma}{1-\gamma}\frac{\kappa}{m}$. Log-linearizing yields the same result as in (B.2) when setting $\rho = 0$.

also the additional recruitment cost κ/m. Unit labor costs thus increase in the wage rate as well as market tightness, $\hat{W} \equiv \frac{w}{W} \cdot \hat{w} + \frac{\kappa/m}{W} \cdot \eta\hat{\theta}$. Substituting (B.2) thus yields

$$\hat{W} = \frac{w}{W}\left[\psi_\theta \cdot \eta\hat{\theta} + \hat{\tau} + \hat{b}\right], \quad \psi_\theta \equiv \frac{1-\tau^*}{1+\rho\chi} + \frac{\kappa/m}{w}. \tag{B.3}$$

Employment per firm depends on output per firm and wage costs relative to the price of skilled labor. Aggregate labor demand additionally reflects the impact on outsourcing which responds to a change in relative profits. Applying the envelope theorem to unit costs in (4), the percentage change with respect to wage costs is $\hat{\omega} = \alpha\hat{W}$ where $\alpha = W\tilde{l}/\omega$ is the cost share of low-tech inputs. Total costs amount to $\omega y = Wl + rh$. The firm's condition $f'(y) = \omega$ for optimal output implies $\hat{y} = -\hat{\omega}/(1-\delta)$ and determines the supply of the final good, $\hat{x} = \delta\hat{y}$. Profits amount to $\pi = x - \omega y = (1-\delta)x$ and thus change in proportion to sales,

$$\hat{\pi} = \hat{x} = -\frac{\alpha\delta}{1-\delta} \cdot \hat{W}, \quad \hat{l} = -\left[1 + \frac{\alpha\delta}{1-\delta}\right] \cdot \hat{W}. \tag{B.4}$$

Labor demand per firm follows from cost shares being constant, $\hat{l} = \hat{\omega} + \hat{y} - \hat{W}$.

With outsourcing, unit costs are $\omega^o = \omega(\lambda w^s, r^o) = \lambda w^s \tilde{l}^s + r^o \tilde{h}^o$ and rise with transport cost by $\hat{\omega}^o = \alpha\hat{\lambda}$. For final assembly, we have $\hat{x}^o = \delta\hat{y}^o$ and $\hat{\omega}^o = -(1-\delta)\hat{y}^o$ as before. Therefore,

$$\hat{\pi}^o = \hat{x}^o = -\frac{\alpha\delta}{1-\delta} \cdot \hat{\lambda}. \tag{B.5}$$

Higher shipping costs add to unit costs and reduce output and profits of outsourcing firms.

A change in relative profits affects the outsourcing margin as in Figure 1. Log-differentiating the discrete choice in (10) yields

$$\hat{q} = -\frac{\pi^o\hat{\pi}^o - \pi\hat{\pi}}{\pi^o - \pi} = \frac{1}{\pi^o - \pi}\left(\lambda w^s l^s \cdot \hat{\lambda} - Wl \cdot \hat{W}\right). \tag{B.6}$$

The second equality follows upon substituting profit changes and using $\pi = (1-\delta)x$ as well as $lW = \alpha\delta x$. When outsourcing expands, extensive labor demand $s = \int_0^q q' dG(q')$ falls by $ds = qg(q)\,dq$ which yields

$$\hat{s} = \mu \cdot \left(\lambda w^s l^s \cdot \hat{\lambda} - Wl \cdot \hat{W}\right), \quad \mu \equiv \frac{qg(q)}{s(q)}\frac{q}{\pi^o - \pi}. \tag{B.7}$$

Aggregate labor demand changes by $\hat{L} = \hat{l} + \hat{s}$. Upon substitution,

$$\hat{L} = L_\lambda \cdot \hat{\lambda} - L_W \cdot \hat{W}, \quad L_\lambda \equiv \mu\lambda w^s l^s, \quad L_W \equiv 1 + \frac{\alpha\delta}{1-\delta} + \mu W l. \tag{B.8}$$

We adopt the convention of defining all coefficients with positive values. Combining with (B.3) shows how labor demand depends on parameters. Figure 2 illustrates how demand shifts according to the signs given below the variables. Solving $e(\theta) = L(\theta; \tau, b, \lambda)$ for market tightness yields the condition for labor market equilibrium $\theta(\tau; b, \lambda)$ in Figure 3. For example, an increase in the tax on unskilled workers shifts down labor demand and reduces market tightness. The labor market condition is therefore downward sloping in Figure 3. Formally, using (B.8) together with (B.3) and solving $e = L$ for the equilibrium change in market tightness yields

$$\hat{\theta} = \frac{1}{\nabla}\frac{WL_\lambda}{wL_W} \cdot \hat{\lambda} - \frac{1}{\nabla} \cdot \left(\hat{\tau} + \hat{b}\right), \quad \nabla \equiv (1-\eta)\frac{W}{wL_W} + \psi_\theta \eta. \tag{B.9}$$

B.2 General Equilibrium

The tax τ on the working poor is endogenously set to balance the fiscal budget. By (1), a higher marginal tax rate T discourages hours worked of the skilled, $\hat{H} = -\sigma \cdot \hat{T}$, where $\sigma \equiv \varphi'/(H\varphi'') > 0$ is the wage elasticity of labor supply. As usual, the change in the tax rate is expressed relative to the tax factor, $\hat{T} \equiv dT/(1-T)$. Labor supply of the low-skilled is given by the employment rate which depends on market tightness as in (14). Differentiating the budget in (15), using $\hat{b} \equiv (db)/w$ and $\hat{\tau} \equiv (d\tau)/w$, yields

$$\hat{\tau} = \frac{1-e}{e} \cdot \hat{b} - \left[1 - \frac{T}{1-T}\sigma\right]\frac{Y_H}{ew} \cdot \hat{T} - \tau^* \cdot (1-\eta)\,\hat{\theta}, \tag{B.10}$$

where $Y_H \equiv (1-T)\,rHN$ denotes aggregate net wage income of the high-skilled, and $\tau^* = (\tau + b)/w$ is a participation tax rate. The tax $\tau(\theta; b, T)$ balancing the fiscal budget is downward sloping in θ, τ-space of Figure 3.

The labor market and fiscal budget must be in simultaneous equilibrium, giving

$$\begin{aligned}
\hat{\theta} &= \tfrac{W}{wL_W}\tfrac{L_\lambda}{\Psi}\hat{\lambda} + \left[1 - \tfrac{T}{1-T}\sigma\right]\tfrac{Y_H}{we\Psi}\hat{T} - \tfrac{1}{e\Psi}\hat{b}, \\
\hat{\tau} &= -\tfrac{\tau^*(1-\eta)W}{wL_W}\tfrac{L_\lambda}{\Psi}\hat{\lambda} - \left[1 - \tfrac{T}{1-T}\sigma\right]\tfrac{Y_H}{we\Psi}\nabla\hat{T} + \tfrac{(1-e)\Psi + (1-\eta)\tau^*}{e\Psi}\hat{b}, \\
\Psi &\equiv \nabla - \tau^*(1-\eta), \quad \nabla \equiv \tfrac{(1-\eta)W}{wL_W} + \psi_\theta\eta, \quad \psi_\theta \equiv \tfrac{1-\tau^*}{1+\rho\chi} + \tfrac{\kappa/m}{w}.
\end{aligned} \tag{B.11}$$

As Figure 3 indicates, the labor market locus must be steeper to assure stability of equilibrium, requiring $\Psi > 0$, see also the discussion on (B.12) below. The signs below the variables in Figure 3 reflect the changes derived in (B.9-B.10) and show in which direction the labor market and budget loci shift after an exogenous shock.

Further analysis requires the general equilibrium impact on wages. An increase in transport costs raises market tightness. Note $\hat{\tau} = -\tau^* (1-\eta)\hat{\theta}$ from the solution above. Using this in the wage equations and keeping other parameters constant yields

$$\hat{\lambda}: \begin{array}{l} \hat{w} = \left[\frac{1-\tau^*}{1+\rho\chi}\eta - (1-\eta)\tau^*\right]\hat{\theta} > 0, \\ \hat{W} = \frac{w}{W}\left[\psi_\theta \eta - (1-\eta)\tau^*\right]\hat{\theta} > 0, \end{array} \Leftrightarrow \frac{\eta}{1-\eta} > \frac{\tau^*(1+\rho\chi)}{1-\tau^*}. \tag{B.12}$$

Higher transport costs raise market tightness since more firms keep hiring locally instead of outsourcing abroad. Higher employment is expected to boost wages. The opposite case is, in principle, possible since higher employment reduces total benefits payments and raises contributions so that the tax τ can be cut which tends to allow for a lower wage. This would be a rather pathological case that should be excluded on empirical grounds. If risk aversion were zero, $\eta \geq \tau^* = (\tau + b)/w$ would guarantee a positive sign. Assuming η large and, correspondingly $1-\eta$ small, dampens the effect of labor market tightness on employment, $\hat{e} = (1-\eta)\hat{\theta}$, which guarantees that increased labor market tightness boosts wages. Henceforth, we assume the condition above to be fulfilled. The impact of market tightness on gross wage costs W is then positive a fortiori (use ψ_θ). Further, it is easy to show that the condition in (B.12) is sufficient for $\Psi > 0$ which guarantees stability.

Raising the tax on the high-skilled to finance a tax cut on the working poor acts like a wage subsidy, boosts job creation and raises market tightness, $\hat{\theta} > 0$. From (B.11), $\hat{\tau} = -\nabla\hat{\theta}$, which yields[24]

$$\begin{array}{lll} \hat{T}: & \hat{w} = -\left[(1-\eta)\frac{W}{wL_W} + \eta\frac{\kappa/m}{w}\right]\hat{\theta} < 0, & \hat{W} = -\frac{1-\eta}{L_W}\hat{\theta} < 0, \\ \hat{b}: & \hat{w} = -\left[(1-\eta)\frac{W}{wL_W} + \eta\frac{\kappa/m}{w}\right]\hat{\theta} > 0, & \hat{W} = -\frac{1-\eta}{L_W}\hat{\theta} > 0. \end{array} \tag{B.13}$$

Raising UI benefits reduces market tightness, $\hat{\theta} = -\hat{b}/(e\Psi)$, and boosts unemployment. Contributions must rise by $\hat{\tau} = -\left[(1-e)\Psi + (1-\eta)\tau^*\right]\hat{\theta} > 0$ to balance the budget. Tax shifting inflates gross wages. Substituting into (B.2) gives the result above.

[24] In case of the redistribution $\hat{T}$, we can also show that net wages rise, $\hat{w} - \hat{\tau} = \frac{1-\tau^*}{1+\rho\chi}\eta\hat{\theta} > 0 > \hat{w}$.

Finally, consider profits $\Pi = \bar{\pi} N$. Since $ds^o = -ds$ and $ds = -q ds^f$, profits in (12) change by $d\Pi = s\pi\hat{\pi} + s^o \pi^o \hat{\pi}^o + [(\pi^o - \pi)\, q - f^o]\, ds^f$. The square bracket is zero by choice of organization. Substitute (B.4-B.5) and note $\pi = (1-\delta)\, x$, $lW = \alpha\delta x$ and $e = sl$,

$$d\Pi = -eW \cdot \hat{W} - s^o l^s \lambda w^s \cdot \hat{\lambda}. \tag{B.14}$$

Since $\hat{\lambda} > 0$ implies $\hat{\theta} > 0$ and by (B.12) also $\hat{W} > 0$, profits unambiguously rise when $\hat{\lambda} < 0$ in the wake of globalization.

References

[1] Acemoglu, Daron and Robert Shimer (1999), Efficient Unemployment Insurance, *Journal of Political Economy 107*, 893-928.

[2] Acemoglu, Daron and Robert Shimer (2000), Wage and Technology Dispersion, *Review of Economic Studies 67*, 585-608.

[3] Anderton, Bob and Paul Brenton (1999), Outsourcing and Low-Skilled Workers in the UK, *Bulletin of Economic Research 51*, 267-285.

[4] Antràs, Pol (2005), Incomplete Contracts and the Product Cycle, *American Economic Review 95*, 1054-1073.

[5] Antràs, Pol and Elhanan Helpman (2004), Global Sourcing, *Journal of Political Economy 112*, 552-580.

[6] Baily, Martin N. (1978), Some Aspects of Optimal Unemployment Insurance, *Journal of Public Economics 10*, 379-402.

[7] Blundell, Richard (2006), Earned Income Tax Credit Policies: Impact and Optimality, *Labor Economics 13*, 423-443.

[8] Boadway, Robin, Manuel Leite-Monteiro, Maurice Marchand, and Pierre Pestieau (2003), Social Insurance and Redistribution, in: Sijbren Cnossen and Hans-Werner Sinn, eds., *Public Finance and Public Policy in the New Century*. Cambridge, MA: MIT Press, 333-358.

[9] Boone, Jan and Lans Bovenberg (2004), The Optimal Taxation of Unskilled Labor with Job Search and Social Assistance, *Journal of Public Economics 88*, 2227– 2258.

[10] Burniaux, Jean-Marc, Thai-Thanh Dang, Douglas Fore, Michael Förster, Marco Mira d'Ercole, and Howard Oxley (1998), *Income Distribution and Poverty in Selected OECD Countries*, OECD Economics Department WP No. 189.

[11] Chetty, Raj (2006), A General Formula for the Optimal Level of Social Insurance, *Journal of Public Economics 90*, 1879-1901.

[12] Cremer, Helmuth and Pierre Pestieau (1996), Redistributive Taxation and Social Insurance, *International Tax and Public Finance 3*, 281-295.

[13] Díaz-Mora, Carmen (2005), *Determinants of Outsourcing Production: A Dynamic Panel Data Approach for Manufacturing Industries*, DEFI WP 05/07.

[14] Díaz-Mora, Carmen and Angela Triguero-Cano (2007), *Why Do Some Firms Contract out Production? Evidence from Firm-Level Panel Data*, FEDEA WP 232.

[15] Egger, Hartmut and Peter Egger (2003), Outsourcing and Skill-Specific Employment in a Small Economy: Austria after the Fall of the Iron Curtain, *Oxford Economic Papers 55*, 625-643.

[16] Eissa, Nada, Henrik J. Kleven, and Claus T. Kreiner (2004), *Evaluation of Four Tax Reforms in the United States: Labor Supply and Welfare Effects for Single Mothers*, NBER WP 10935.

[17] Ekholm, Karolina and Katariina Hakkala (2005), *The Effect of Offshoring on Labor Demand: Evidence from Sweden*, Research Institute of Industrial Economics WP 654.

[18] Falk, Martin and Yvonne Wolfmayr (2005), *The Impact of International Outsourcing on Employment: Empirical Evidence from EU Countries*, Austrian Institute of Economic Research WIFO WP.

[19] Feenstra, Robert C. and Gordon H. Hanson (1996a), Foreign Investment, Outsourcing and Relative Wages, in Robert C. Feenstra, Gene M. Grossman, and Douglas A. Irwin, eds., *Political Economy of Trade Policy: Essays in Honor of Jagdish Bhagwati.* Cambridge, MA: MIT Press, 89-127.

[20] Feenstra, Robert C. and Gordon H. Hanson (1996b), Globalization, Outsourcing, and Wage Inequality, *American Economic Review 86*, 240-245.

[21] Feldstein, Martin and James Poterba (1984), Unemployment Insurance and Reservation Wages, *Journal of Public Economics 23*, 141-167.

[22] Fishe, Raymond P.H. (1982), Unemployment Insurance and the Reservation Wage of the Unemployed, *Review of Economics and Statistics 64*, 12-17.

[23] Gaube, Thomas (2005), Income Taxation, Endogenous Factor Prices and Production Efficiency, *Scandinavian Journal of Economics 107*, 335-352.

[24] Grossman, Gene and Elhanan Helpman (2002), Integration versus Outsourcing in Industry Equilibrium, *Quarterly Journal of Economics 117*, 85-120.

[25] Gruber, Jonathan (1997), The Consumption Smoothing Benefits of Unemployment Insurance, *American Economic Review 87*, 192-205.

[26] Guesnerie, Roger (2001), Second-Best Redistributive Policies: The Case of International Trade, *Journal of Public Economic Theory 3*, 15-25.

[27] Harrison, Ann E. and Margaret S. McMillan (2006), *Outsourcing Jobs? Multinationals and US Employment*, NBER WP 12372.

[28] Helpman, Elhanan (2006), Trade, FDI, and the Organization of Firms, *Journal of Economic Literature 44*, 589-630.

[29] Helpman, Elhanan, Marc J. Melitz, and Stephen R. Yeaple (2004), Export versus FDI with Heterogeneous Firms, *American Economic Review 99*, 300-316.

[30] Hijzen, Alexander, Holger Görg, and Robert C. Hine (2005), International Outsourcing and the Skill Structure of Labour Demand in the United Kingdom, *Economic Journal 115*, 860–878.

[31] Immervoll, Herwig, Henrik J. Kleven, Claus T. Kreiner, and Emmanuel Saez (2007), Welfare Reform in European Countries: A Microsimulation Analysis, *Economic Journal 117*, 1–44.

[32] Keuschnigg, Christian (2006), *Exports, Foreign Direct Investment and the Costs of Corporate Taxation*, CEPR DP 5769.

[33] Lancaster, Tony and Andrew Chesher (1983), An Econometric Analysis of Reservation Wages, *Econometrica 51*, 1661-1676.

[34] Mankiw, N. Gregory and Stephen P. Zeldes (1991), The Consumption of Stockholders and Nonstockholders, *Journal of Financial Economics 29*, 97-112.

[35] Melitz, Marc J. (2003), The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, *Econometrica 71*, 1695-1725.

[36] Nickell, Stephen (1997), Unemployment and Labor Market Rigidities: Europe versus North America, *Journal of Economic Perspectives 11*, 55-74.

[37] OECD (2007a), *OECD Employment Outlook*, OECD, Paris.

[38] OECD (2007b), *Offshoring and Employment: Trends and Impacts*, OECD, Paris.

[39] Phelps, Edmund S. (2000), The Importance of Inclusion and the Power of Job Subsidies to Increase it, *OECD Economic Studies 31*, 85-113.

[40] Razin, Assaf and Efraim Sadka (2005), *The Decline of the Welfare State. Demography and Globalization*, (with contributions by Chang Woon Nam), Cambridge, MA: MIT Press.

[41] Razin, Assaf, Efraim Sadka, and Phillip Swagel (2002), Tax Burden and Migration: A Political Economy Theory and Evidence, *Journal of Public Economics 85*, 167-190.

[42] Rodrik, Dani (1998), Why Do More Open Economies Have Bigger Governments?, *Journal of Political Economy 106*, 997-1032.

[43] Saez, Emmanuel (2002), Optimal Income Transfer Programs: Intensive versus Extensive Labor Supply Responses, *Quarterly Journal of Economics 117*, 1039-1073.

[44] Sinn, Hans-Werner (2007), *The Welfare State and the Forces of Globalization*, CESifo WP 1925.

[45] Spector, David (2001), Is it Possible to Redistribute the Gains from Trade Using Income Taxation?, *Journal of International Economics 55*, 441-460.

[46] Strauss-Kahn, Vanessa (2003), *The Role of Globalization in the Within-Industry Shift away from Unskilled Workers in France*, NBER WP 9716.

[47] Van den Berg, Gerard J. (1990), Search Behaviour, Transitions to Non-participation and the Duration of Unemployment, *Economic Journal 100*, 842-865.

[48] Wolff, Edward N. (1998), Recent Trends in the Size Distribution of Household Wealth, *Journal of Economic Perspectives 12*, 131-150.