

Technical Appendix to LABOUR MARKET EFFECTS OF INTERNATIONAL TRADE WHEN MOBILITY IS COSTLY

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ECONOMIC JOURNAL, doi: 10.1111/econj.12543

Appendix A. Solving the Model

The set of structural model parameters consists of the discount factor, ρ , the full set of 26 wage offer function parameters for all sectors, β and σ (which includes the standard error of the shock to the value of being unemployed), the 16 unobserved permanent heterogeneity and type probability parameters, λ and ϕ , the 16 mobility cost parameters, ξ and κ , the six experience depreciation parameters γ , the three unemployment benefit parameters, k , \overline{UI} , and WA , and finally the scale parameter of the preference shock, v .

Solving the model for a given set of structural parameters involves computing the expected values in the Bellman equations (3) and (4), which presents several computational challenges. First, taking the expectation involves integrating over the distributions of η_{it}^s and ε_{it}^s . The distributional assumptions on these in (10), means that the integral over η_{it}^s has a convenient closed form solution (Rust, 1994). The integral over ε_{it}^s does not have a closed form, and therefore has to be numerically approximated. Here the integration is done by Monte Carlo methods.¹ The second difficulty concerns the ‘curse of dimensionality’. The state space in (13) is large and contains continuous variables (Exper_{it} , $\{\mathbf{r}_{t+\tau}\}_{\tau=0}^{65-a}$ and $w_{i,t-T}$). To address this issue, I employ the Keane and Wolpin (1994) method of computing the expectations only at a subset of the state space and then interpolating and extrapolating over this subset by regression. Here, that is done by second order polynomial regression, including all cross-terms. To obtain the equilibrium sequence of human capital prices, I use the perfect foresight algorithm developed by Lee (2005).

Dropping the individual subscript i for convenience, I define:

$$\begin{aligned} & \text{Emax}_t(\text{age, Female, Educ, Elig, Type}, s_{t-1}, \text{Exper}_t, \mathbf{r}_t, \{\mathbf{r}_{t+\tau}^*\}_{\tau=1}^{65-\text{age}}, w_{t-T}) \\ & = \mathbb{E}_{\varepsilon, \eta} \mathbf{V}(\text{age, Female, Educ, Elig, Exper}_t, \mathbf{r}_t, \{\mathbf{r}_{t+\tau}^*\}_{\tau=1}^{65-\text{age}}, w_{t-T}, \boldsymbol{\lambda}, \boldsymbol{\varepsilon}, \boldsymbol{\eta} | d_{t-1} = s_{t-1}), \end{aligned}$$

to be the expected value, prior to drawing contemporaneous shocks of ε and η , of a worker in year t , who in the previous year was employed in sector s_{t-1} , where s_{t-1} can also be 0, in which case the worker was unemployed. Here, \mathbf{r}_t is the current human capital prices, and $\{\mathbf{r}_{t+\tau}^*\}_{\tau=1}^{65-\text{age}}$ are the future human capital prices. Given the assumptions of the model, $\boldsymbol{\lambda}$ depends only on whether the worker is of type 1 or 2. Now, let:

$$\Delta = \{(\text{Exper}_t, w_{t-T}) | \text{Exper}_t \leq 35; \underline{w} \leq w_{t-T} \leq \overline{w}\},$$

¹ Other integration methods can be used such as Gauss–Hermite quadrature (Judd, 1998) but these methods are computationally expensive for high-dimensional problems. Although the dimensionality problem can be somewhat alleviated by sparse grid or monomial methods, this comes at the cost of precision.

where \underline{w} and \bar{w} are lower and upper bounds for wage in previous employment, respectively.² $\text{Emax}_t(\cdot)$ is approximated for all $\text{Female} \in \{0, 1\}$, $\text{Educ} \in \{0, 1\}$, $\text{Elig} \in \{0, 1\}$, $\text{Type} \in \{1, 2\}$, and $s_{t-1} \in \{0, 1, 2, 3, 4, 5\}$ by the backward recursion algorithm:

- (i) Start at the final period $t = T$ and the final age = 65. Draw $N = 1,500$ random values of $\{\mathbf{z}^n = (\text{Exper}^n, w_{T-T}^n)\}_{n=1}^N \in \Delta$.
- (ii) For each n draw ε and integrate over η . Then integrate over the ε draws to get an approximation of $\text{Emax}_T(65, \text{Female}, \text{Educ}, \text{Elig}_T, \text{Type}, s_{T-1}, \mathbf{r}_T, \{\mathbf{r}_{T+\tau}^*\}_{\tau=1}^{65-\text{age}}, \mathbf{z}^n)$.
- (iii) Approximate $\text{Emax}_T(65, \text{Female}, \text{Educ}, \text{Elig}_T, \text{Type}, s_{T-1}, \mathbf{r}_T, \{\mathbf{r}_{T+\tau}^*\}_{\tau=1}^{65-\text{age}}, \cdot)$ by a second order polynomial regression, including cross-products, of $\text{Emax}_T(65, \text{Female}, \text{Educ}, \text{Elig}_T, \text{Type}, s_{T-1}, \mathbf{r}_T, \{\mathbf{r}_{T+\tau}^*\}_{\tau=1}^{65-\text{age}}, \mathbf{z}^n)_{n=1}^N$ on $\{1, \text{Exper}^n, w_{T-T}^n\}_{n=1}^N$. This polynomial regression gives a very good fit: for all regressions I have $R^2 \geq 0.90$.
- (iv) Repeat steps 1 to 3 recursively for age = 64 through age = 31 to get an approximation for $\text{Emax}_T(\text{age}, \text{Female}, \text{Educ}, \text{Elig}_T, \text{Type}, s_{T-1}, \mathbf{r}_T, \{\mathbf{r}_{T+\tau}^*\}_{\tau=1}^{65-\text{age}}, \cdot)$. Since this is the final year workers have static expectations over the future human capital prices.
- (v) Repeat steps 1 to 4 for periods $t = T - 1$ to $t = 1$ using equilibrium skill prices such that $\mathbf{r}_t = \mathbf{r}_t^*$.

Once the model is solved, it can be estimated. The article proceeds with a section describing the data set used for estimation before turning to estimation strategy and results.

Appendix B. Unemployment Benefits in Denmark

This Section describes the institutional setting for the unemployed in Denmark as applicable to the period from 1996 to 2008. The structural model in Section 1 includes a model of the institutional setting presented here.

All unemployed workers who wish to receive benefits must be registered as ‘seeking employment’ at local job-centres run by the government. Then there are two separate systems: one for members of unemployment insurance (UI) fund, and one for those who are not.

Figure B1 shows that the vast majority of the workforce are members of a UI fund; the membership rate is about 70–77% in the period shown.

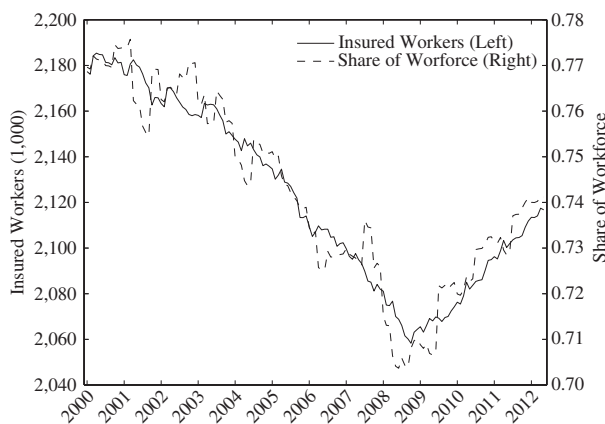


Fig. B1. *Insured Workers*

² The choice of upper and lower bounds for w_{t-T} is somewhat arbitrary. They should be chosen to give sufficient variation for the interpolation regression. Here, they are chosen such that all observed values lie within the bounds.

B.1. *Benefits for the Insured*

The UI system is administered by government approved UI funds ('A-kasser'). In order to be eligible for UI benefits, a worker must satisfy certain criteria. The worker must:

- (i) have been member of an UI fund for at least one year;
- (ii) satisfy the employment criterion;
- (iii) satisfy the availability criteria; and
- (iv) not be unemployed by self-infliction.

The employment criterion states that full-time insured must have been employed for at least 52 weeks out of the last three years while the part-time insured must have been employed for at least 34 weeks out of the last three years in order to be eligible for UI benefits. Some of the availability criteria are that the worker must actively seek any employment opportunities and reside in Denmark.

If the worker is eligible for UI benefits, then the weekly benefit is calculated as 90% of the worker's labour income for the past 3 months or 12 weeks, depending on whether the wage was paid on a monthly basis, or weekly or biweekly basis. However, the maximum benefit is DKK 3,515 per week from 1 January 2008. This number is regulated once a year by a factor that takes into account the general development of wages for the employed. The UI benefits are paid out for a maximum of four years after which the benefits expire.

Since the maximum UI benefit is capped at DKK 203,090 a year in 2008, the degree of compensation drops in incomes above this level. The resulting compensation degree is 61 and 46% for yearly incomes of DKK 300,000 and DKK 400,000, respectively.

B.2. *Benefits for the Uninsured*

The unemployed workers who are either uninsured or ineligible for UI benefits may apply for welfare assistance ('kontanthjælp'). The size of the assistance depends on a number of factors. For workers of age 25 and above who are caretakers of children, the monthly maximum

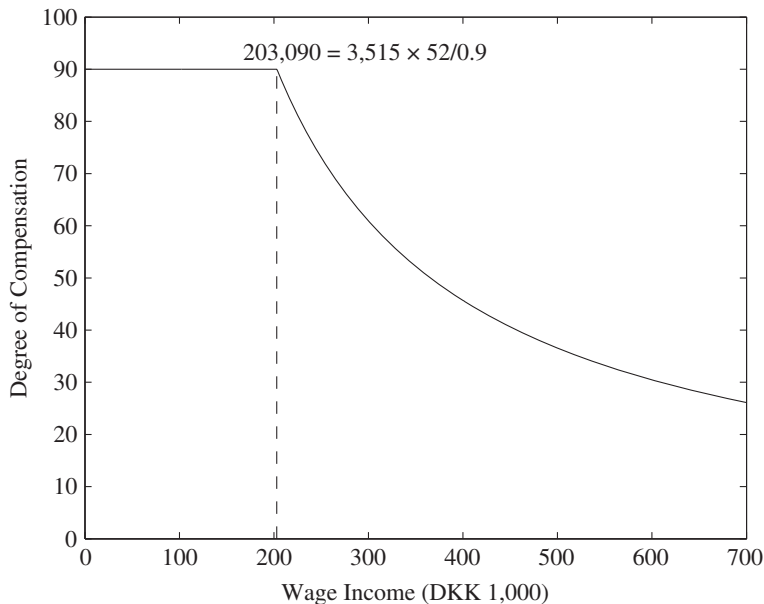


Fig. B2. *Compensation Rate*

assistance is DKK 13,732 in 2012, while that Figure is DKK 10.335 for those without children. For workers under the age of 25, the maximum assistance is DKK 6,660 for caretakers and DKK 5,662 for others.

However, workers are only eligible for assistance if their assets do not exceed a total value of DKK 10,000. Furthermore, spousal income is deducted from the assistance.

Appendix C. Sectors

Table C1

Mapping from NACE Rev. 2 to Sectors

Agriculture/ mining	Agriculture and horticulture (01); forestry (02); fishing (03); extraction of oil and gas (06); extraction of gravel and stone (08); mining support service activities (09)
Manufacturing	Food products (10); beverages (11); tobacco products (12); textiles (13); wearing apparel (14); leather and related products (15); wood and wood products (16); paper and paper products (17); printing and reproduction of recorded media (18); coke and refined petroleum products (19); chemicals and chemical products (20); pharmaceuticals (21); rubber and plastic products (22); other non-metallic mineral products (23); basic metals (24); fabricated metal products (25); computer, electronic and optical products (26); electrical equipment (27); machinery and equipment (28); motor vehicles (29); other transport equipment (30); furniture (31); other manufacturing (32); repair and installation of machinery and equipment (33)
Construction	New buildings (41); civil engineering (42); specialised construction activities (43)
Trade/utilities/ transportation/ communication	Electricity, gas, steam and air conditioning supply (35); water collection, treatment and supply (36); sewerage (37); waste and recycling (38); wholesale and retail trade and repair of motor vehicles and motorcycles (45); wholesale trade (46); retail trade (47); land transport and transport via pipelines (49); water transport (50); air transport (51); support activities for transportation (52); postal and courier (53); publishing (58); motion picture and TV program production (59); programming and broadcasting (60); telecommunications (61); computer programming and consultancy (62); information services (63)
Services	Accommodation (55); food and beverage services (56); financial services (64); insurance and pension funding (65); other financial activities (66); real estate (68); legal and accounting (69); business consultancy (70); architecture and engineering (71); scientific research and development (72); advertising and market research (73); other professional, scientific and technical activities (74); veterinary activities (75); renting and leasing (77); employment (78); travel agency (79); security and investigation (80); services to buildings and landscapes (81); other business services (82); public administration (84); education (85); human health (86); residential care (87); social work (88); creative, arts and entertainment (90); libraries and museums (91); gambling and betting (92); sports (93); activities of membership organisations (94); repair of personal goods (95); other personal services (96); activities of households as employers of domestic personnel (97)

Appendix D. Asymptotic Distribution of the SMD Estimator

Define the SMD estimator (Hall and Rust, 2002; Alan, 2006; Browning *et al.*, 2010) as:

$$\hat{\theta}_{SMD} = \arg \min_{\theta} [\mathbf{a}^S(\theta) - \mathbf{a}^D]' \mathbf{A} [\mathbf{a}^S(\theta) - \mathbf{a}^D], \quad (\text{D.1})$$

where $\mathbf{a}^S(\theta)$ and \mathbf{a}^D are vectors of auxiliary parameters obtained from simulated and actual data, respectively. The positive definite weighting matrix \mathbf{A} is assumed to converge to a non-stochastic matrix.

Let $\widehat{\theta}$ be a particular vector of structural parameters. If the model is well specified $\mathbf{a}^S(\widehat{\theta})$ converges to \mathbf{a}^D . Then, by using $\text{plim } \mathbf{a}^S(\widehat{\theta}) = \mathbf{a}^\infty(\widehat{\theta})$ and $\text{plim } \mathbf{a}^D = \mathbf{a}^0(\theta_0)$, we have:

$$\text{plim } \widehat{\theta}_{SMD} = \theta_0,$$

where $\mathbf{a}^\infty(\widehat{\theta})$ is the vector of auxiliary parameters that results for a given $\widehat{\theta}$ when using $J = \infty$ number of simulations to construct $\mathbf{a}^S(\widehat{\theta})$, and $\mathbf{a}^0(\theta_0)$ is the true vector of auxiliary parameters.

Let:

$$\begin{aligned} \mathbf{a}^S(\widehat{\theta}) - \mathbf{a}^D &= \mathbf{a}^S(\widehat{\theta}) - \mathbf{a}^D + \mathbf{a}^\infty(\theta_0) - \mathbf{a}^\infty(\theta_0) + \mathbf{a}^0(\theta_0) - \mathbf{a}^0(\theta_0) \\ &= [\mathbf{a}^S(\widehat{\theta}) - \mathbf{a}^\infty(\theta_0)] + [\mathbf{a}^0(\theta_0) - \mathbf{a}^D] + [\mathbf{a}^\infty(\theta_0) - \mathbf{a}^0(\theta_0)], \end{aligned}$$

where the last term cancels out when the model is well specified. Now, apply the central limit theorem and evaluate at: $\widehat{\theta} = \theta_0$ to get:

$$\sqrt{n}[\mathbf{a}^S(\theta_0) - \mathbf{a}^D] = \sqrt{n}[\mathbf{a}^S(\theta_0) - \mathbf{a}^\infty(\theta_0)] + \sqrt{n}[\mathbf{a}^0(\theta_0) - \mathbf{a}^D],$$

and:

$$\sqrt{n}[\mathbf{a}^S(\theta_0) - \mathbf{a}^D] \longrightarrow^d \mathcal{N}\left(0, \frac{J+1}{J} \mathbf{M}_0\right), \quad (\text{D.2})$$

where J is the number of simulations used to construct $\mathbf{a}^S(\theta_0)$ and \mathbf{M}_0 is the true variance-covariance matrix.

The first-order condition of the optimisation problem in (D.1) is:

$$[\mathbf{a}^S(\widehat{\theta}_{SMD}) - \mathbf{a}^D]' \mathbf{A} \nabla \mathbf{a}^S(\widehat{\theta}_{SMD}) = 0,$$

and a Taylor series expansion around θ_0 gives:

$$\mathbf{a}^S(\widehat{\theta}_{SMD}) = \mathbf{a}^S(\theta_0) + \nabla \mathbf{a}^S(\theta_0) [\widehat{\theta}_{SMD} - \theta_0].$$

Substitute back into the first order condition and solve for $[\widehat{\theta}_{SMD} - \theta_0]$ to get:

$$[\widehat{\theta}_{SMD} - \theta_0] = -[\nabla \mathbf{a}^S(\widehat{\theta}_{SMD})' \mathbf{A} \nabla \mathbf{a}^S(\widehat{\theta}_{SMD})]^{-1} \nabla \mathbf{a}^S(\widehat{\theta}_{SMD})' \mathbf{A} [\mathbf{a}^S(\theta_0) - \mathbf{a}^D].$$

Using this and (D.2) we get:

$$\sqrt{n}(\widehat{\theta}_{SMD} - \theta_0) \longrightarrow^d \mathcal{N}\left(0, \frac{J+1}{J} \mathbf{G}_1^{-1} \mathbf{G}_2 \mathbf{G}_1^{-1}\right),$$

where:

$$\begin{aligned} \mathbf{G}_1 &= [\text{plim } \nabla \mathbf{a}^S(\theta_0)]' \mathbf{A}_\infty [\text{plim } \nabla \mathbf{a}^S(\theta_0)], \\ \mathbf{G}_2 &= [\text{plim } \nabla \mathbf{a}^S(\theta_0)]' \mathbf{A}_\infty \mathbf{M}_0 \mathbf{A}_\infty [\text{plim } \nabla \mathbf{a}^S(\theta_0)]. \end{aligned}$$

With the optimal weighting matrix $\mathbf{A} = \mathbf{M}_0^{-1}$, the asymptotic distribution of the simulated minimum distance estimator is:

$$\sqrt{n}(\widehat{\theta}_{SMD} - \theta_0) \longrightarrow^d \mathcal{N}\left(0, \frac{J+1}{J} \mathbf{G}^{-1}\right),$$

where:

$$\mathbf{G} = [\text{plim } \nabla \mathbf{a}^S(\theta_0)]' \mathbf{M}_0^{-1} [\text{plim } \nabla \mathbf{a}^S(\theta_0)].$$

Appendix E. Auxiliary Parameters

Table E1
Log-wage Regressions

	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Female	-0.226241 (0.0018)	-0.169728 (0.0003)	-0.168647 (0.0009)	-0.198453 (0.0004)	-0.207124 (0.0002)
Educ	0.161606 (0.0019)	0.316589 (0.0004)	0.215107 (0.0008)	0.289084 (0.0005)	0.229263 (0.0002)
Age	0.038069 (0.0008)	0.012849 (0.0002)	0.017199 (0.0003)	0.017997 (0.0002)	0.012515 (0.0001)
Age ²	-0.000440 (0.0000)	-0.000179 (0.0000)	-0.000216 (0.0000)	-0.000257 (0.0000)	-0.000167 (0.0000)
Exper	0.004497 (0.0001)	0.006815 (0.0000)	0.006419 (0.0000)	0.008285 (0.0000)	0.006859 (0.0000)
1996	4.231317 (0.0180)	4.836345 (0.0037)	4.724536 (0.0067)	4.757651 (0.0043)	4.846028 (0.0025)
1997	4.224913 (0.0180)	4.823436 (0.0037)	4.708768 (0.0067)	4.750908 (0.0043)	4.832797 (0.0025)
1998	4.247642 (0.0180)	4.866347 (0.0037)	4.731991 (0.0067)	4.774774 (0.0043)	4.860608 (0.0025)
1999	4.240998 (0.0180)	4.854302 (0.0037)	4.738804 (0.0067)	4.775157 (0.0043)	4.861966 (0.0025)
2000	4.251494 (0.0180)	4.860062 (0.0037)	4.743351 (0.0067)	4.778431 (0.0043)	4.867408 (0.0025)
2001	4.267058 (0.0180)	4.873846 (0.0037)	4.763543 (0.0067)	4.793411 (0.0043)	4.886463 (0.0025)
2002	4.279963 (0.0180)	4.877963 (0.0037)	4.763591 (0.0067)	4.793470 (0.0043)	4.884342 (0.0025)
2003	4.245921 (0.0180)	4.862613 (0.0037)	4.746932 (0.0067)	4.771257 (0.0043)	4.866902 (0.0025)
2004	4.245542 (0.0180)	4.860584 (0.0037)	4.746077 (0.0066)	4.762179 (0.0043)	4.876557 (0.0025)
2005	4.291993 (0.0180)	4.903308 (0.0037)	4.787530 (0.0066)	4.803551 (0.0043)	4.913089 (0.0025)
2006	4.319431 (0.0180)	4.925783 (0.0037)	4.814797 (0.0066)	4.824168 (0.0043)	4.935360 (0.0025)
2007	4.343912 (0.0180)	4.947456 (0.0037)	4.839264 (0.0066)	4.852874 (0.0043)	4.956261 (0.0025)
2008	4.346454 (0.0180)	4.941269 (0.0037)	4.829658 (0.0066)	4.855021 (0.0043)	4.969325 (0.0025)
Root MSE	0.373505	0.276870	0.285019	0.336883	0.306287
R ²	0.995	0.997	0.997	0.996	0.997
Observations	268,224	3,791,930	1,204,452	3,968,220	10,331,959

Notes. Standard errors in parentheses. Sectors: (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E2
LPMs for Sectoral Choices

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.238122 (0.0001)	-0.006493 (0.0001)	0.068109 (0.0002)	0.008673 (0.0001)	0.060639 (0.0002)	0.107193 (0.0003)
Female	-0.048832 (0.0001)	-0.013967 (0.0001)	-0.092590 (0.0002)	-0.081053 (0.0001)	-0.074661 (0.0002)	0.311104 (0.0002)
Educ	0.028721 (0.0001)	-0.006450 (0.0001)	-0.116259 (0.0002)	-0.049941 (0.0001)	-0.149601 (0.0002)	0.293530 (0.0002)
Age	0.002480 (0.0000)	-0.000237 (0.0000)	-0.001239 (0.0001)	-0.000808 (0.0001)	-0.013334 (0.0001)	0.013138 (0.0001)
Age ²	0.000003 (0.0000)	0.000003 (0.0000)	-0.000019 (0.0000)	0.000004 (0.0000)	0.000106 (0.0000)	-0.000096 (0.0000)
Exper	-0.002878 (0.0000)	-0.000317 (0.0000)	0.001281 (0.0000)	-0.000130 (0.0000)	0.002234 (0.0000)	-0.000190 (0.0000)
1996	1.234994 (0.0011)	0.065556 (0.0007)	-0.008355 (0.0025)	0.091100 (0.0015)	0.291291 (0.0025)	-0.674585 (0.0029)
1997	1.227444 (0.0011)	0.065570 (0.0007)	-0.005980 (0.0025)	0.091821 (0.0015)	0.292671 (0.0025)	-0.671527 (0.0029)
1998	1.222500 (0.0011)	0.065808 (0.0007)	-0.004807 (0.0025)	0.093531 (0.0015)	0.294144 (0.0025)	-0.671177 (0.0029)
1999	1.219270 (0.0011)	0.065834 (0.0007)	-0.007522 (0.0025)	0.095088 (0.0015)	0.296119 (0.0025)	-0.668789 (0.0029)
2000	1.220087 (0.0011)	0.066050 (0.0007)	-0.007548 (0.0025)	0.097477 (0.0015)	0.294483 (0.0025)	-0.670549 (0.0029)
2001	1.222614 (0.0011)	0.066511 (0.0007)	-0.010212 (0.0025)	0.097917 (0.0015)	0.292393 (0.0025)	-0.669223 (0.0029)
2002	1.224746 (0.0011)	0.066865 (0.0007)	-0.012993 (0.0025)	0.097793 (0.0015)	0.292380 (0.0025)	-0.668791 (0.0029)
2003	1.227922 (0.0011)	0.066502 (0.0007)	-0.017643 (0.0025)	0.098302 (0.0015)	0.294711 (0.0025)	-0.669795 (0.0029)
2004	1.226824 (0.0011)	0.066672 (0.0007)	-0.022866 (0.0025)	0.099391 (0.0015)	0.296509 (0.0025)	-0.666531 (0.0029)
2005	1.228806 (0.0011)	0.066942 (0.0007)	-0.028635 (0.0025)	0.102148 (0.0015)	0.297839 (0.0025)	-0.667101 (0.0029)

Table E2
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2006	1.225191 (0.0011)	0.067052 (0.0007)	-0.029675 (0.0025)	0.105195 (0.0015)	0.297968 (0.0025)	-0.665731 (0.0029)
2007	1.224321 (0.0011)	0.067834 (0.0007)	-0.030648 (0.0025)	0.105614 (0.0015)	0.299445 (0.0025)	-0.666566 (0.0029)
2008	1.224663 (0.0011)	0.067550 (0.0007)	-0.040619 (0.0025)	0.103123 (0.0015)	0.301438 (0.0025)	-0.656155 (0.0029)
R ²	0.256	0.018	0.222	0.099	0.235	0.604
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes: Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E3
LPMs for Transitions from Unemployment

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.110619 (0.0001)	-0.000334 (0.0000)	-0.001548 (0.0000)	-0.000279 (0.0000)	-0.003228 (0.0000)	-0.008016 (0.0001)
Female	-0.024391 (0.0001)	-0.000372 (0.0000)	-0.001857 (0.0000)	-0.002753 (0.0000)	-0.002016 (0.0000)	0.002909 (0.0000)
Educ	0.010910 (0.0001)	-0.000582 (0.0000)	-0.0003605 (0.0000)	-0.001865 (0.0000)	-0.001865 (0.0000)	-0.001547 (0.0000)
Age	0.000953 (0.0000)	0.000045 (0.0000)	0.000290 (0.0000)	0.000184 (0.0000)	0.000035 (0.0000)	0.000798 (0.0000)
Age ²	0.000013 (0.0000)	-0.000000 (0.0000)	-0.000002 (0.0000)	-0.000001 (0.0000)	0.000002 (0.0000)	-0.000002 (0.0000)
Exper	-0.002223 (0.0000)	-0.000070 (0.0000)	-0.000378 (0.0000)	-0.000175 (0.0000)	-0.000410 (0.0000)	-0.001212 (0.0000)
1996	0.583272 (0.0008)	0.002256 (0.0002)	0.012540 (0.0004)	0.002824 (0.0003)	0.025953 (0.0004)	0.043482 (0.0006)
1997	0.579919 (0.0008)	0.002188 (0.0002)	0.013348 (0.0004)	0.002419 (0.0003)	0.026171 (0.0004)	0.041768 (0.0006)
1998	0.573247 (0.0008)	0.002176 (0.0002)	0.013261 (0.0004)	0.002208 (0.0003)	0.026745 (0.0004)	0.043022 (0.0006)
1999	0.567279 (0.0008)	0.002147 (0.0002)	0.011475 (0.0004)	0.002101 (0.0003)	0.025519 (0.0004)	0.040806 (0.0006)
2000	0.567839 (0.0008)	0.002118 (0.0002)	0.012369 (0.0004)	0.002309 (0.0003)	0.025367 (0.0004)	0.040165 (0.0006)
2001	0.567922 (0.0008)	0.002167 (0.0002)	0.011788 (0.0004)	0.002047 (0.0003)	0.025327 (0.0004)	0.041497 (0.0006)
2002	0.566849 (0.0008)	0.002091 (0.0002)	0.011252 (0.0004)	0.001978 (0.0003)	0.025217 (0.0004)	0.039911 (0.0006)
2003	0.569150 (0.0008)	0.002086 (0.0002)	0.010751 (0.0004)	0.002251 (0.0003)	0.025093 (0.0004)	0.040033 (0.0006)
2004	0.572354 (0.0008)	0.002189 (0.0002)	0.012031 (0.0004)	0.002659 (0.0003)	0.026701 (0.0004)	0.043362 (0.0006)

Table E3
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2005	0.574465 (0.0008)	0.002193 (0.0002)	0.012119 (0.0004)	0.002588 (0.0003)	0.026632 (0.0004)	0.043404 (0.0006)
2006	0.572500 (0.0008)	0.002068 (0.0002)	0.011764 (0.0004)	0.002086 (0.0003)	0.026491 (0.0004)	0.042452 (0.0006)
2007	0.570604 (0.0008)	0.001997 (0.0002)	0.010577 (0.0004)	0.001435 (0.0003)	0.025578 (0.0004)	0.041211 (0.0006)
2008	0.567908 (0.0008)	0.001858 (0.0002)	0.009629 (0.0004)	0.001254 (0.0003)	0.024741 (0.0004)	0.040146 (0.0006)
R ²	0.136	0.001	0.007	0.004	0.007	0.020
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes. Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E4
LPMs for Transitions from Agriculture/Mining

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.003217 (0.0000)	-0.005189 (0.0001)	-0.000242 (0.0000)	-0.000262 (0.0000)	-0.000250 (0.0000)	-0.000540 (0.0000)
Female	-0.000906 (0.0000)	-0.012181 (0.0000)	-0.000441 (0.0000)	-0.000556 (0.0000)	-0.000353 (0.0000)	-0.000312 (0.0000)
Educ	0.000160 (0.0000)	-0.005158 (0.0001)	-0.000238 (0.0000)	-0.000206 (0.0000)	-0.000218 (0.0000)	-0.000096 (0.0000)
Age	0.000068 (0.0000)	-0.000267 (0.0000)	-0.000027 (0.0000)	-0.000028 (0.0000)	-0.000041 (0.0000)	0.000040 (0.0000)
Age ²	-0.000000 (0.0000)	0.000003 (0.0000)	0.000000 (0.0000)	0.000000 (0.0000)	0.000000 (0.0000)	-0.000000 (0.0000)
Exper	-0.000040 (0.0000)	-0.000213 (0.0000)	-0.000010 (0.0000)	-0.000003 (0.0000)	-0.000009 (0.0000)	-0.000026 (0.0000)
1996	0.016077 (0.0002)	0.055045 (0.0007)	0.002933 (0.0001)	0.002797 (0.0001)	0.003069 (0.0001)	0.002777 (0.0001)
1997	0.016092 (0.0002)	0.055154 (0.0007)	0.002891 (0.0001)	0.002846 (0.0001)	0.003121 (0.0001)	0.002842 (0.0001)
1998	0.016237 (0.0002)	0.055361 (0.0007)	0.003137 (0.0001)	0.002852 (0.0001)	0.003117 (0.0001)	0.002859 (0.0001)
1999	0.016276 (0.0002)	0.055342 (0.0007)	0.002936 (0.0001)	0.002879 (0.0001)	0.003152 (0.0001)	0.002876 (0.0001)
2000	0.016270 (0.0002)	0.055423 (0.0007)	0.002932 (0.0001)	0.002895 (0.0001)	0.003141 (0.0001)	0.002895 (0.0001)
2001	0.016258 (0.0002)	0.055791 (0.0007)	0.002925 (0.0001)	0.002890 (0.0001)	0.003138 (0.0001)	0.002972 (0.0001)
2002	0.016373 (0.0002)	0.055802 (0.0007)	0.002965 (0.0001)	0.002882 (0.0001)	0.003158 (0.0001)	0.002900 (0.0001)
2003	0.016314 (0.0002)	0.056009 (0.0007)	0.002889 (0.0001)	0.003018 (0.0001)	0.003118 (0.0001)	0.003055 (0.0001)
2004	0.016301 (0.0002)	0.056066 (0.0007)	0.002855 (0.0001)	0.002957 (0.0001)	0.003155 (0.0001)	0.002907 (0.0001)

Table E4
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2005	0.016291 (0.0002)	0.056268 (0.0007)	0.002965 (0.0001)	0.002959 (0.0001)	0.003212 (0.0001)	0.003037 (0.0001)
2006	0.016259 (0.0002)	0.056239 (0.0007)	0.003019 (0.0001)	0.003072 (0.0001)	0.003294 (0.0001)	0.003017 (0.0001)
2007	0.016249 (0.0002)	0.056391 (0.0007)	0.003041 (0.0001)	0.003004 (0.0001)	0.003330 (0.0001)	0.003074 (0.0001)
2008	0.016343 (0.0002)	0.056510 (0.0007)	0.003114 (0.0001)	0.002935 (0.0001)	0.003255 (0.0001)	0.003519 (0.0001)
R ²	0.003	0.015	0.001	0.001	0.001	0.001
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes. Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E5
LPMs for Transitions from Manufacturing

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.032557 (0.0000)	-0.000221 (0.0000)	0.068188 (0.0002)	-0.000510 (0.0000)	-0.000190 (0.0000)	0.000148 (0.0000)
Female	-0.007564 (0.0000)	-0.000372 (0.0000)	-0.085101 (0.0002)	-0.002345 (0.0000)	-0.003054 (0.0000)	-0.001020 (0.0000)
Educ	0.002974 (0.0000)	-0.000217 (0.0000)	-0.109003 (0.0002)	-0.001121 (0.0000)	-0.002439 (0.0000)	0.000092 (0.0000)
Age	0.000414 (0.0000)	-0.000018 (0.0000)	-0.000722 (0.0001)	-0.000103 (0.0000)	-0.000340 (0.0000)	-0.000192 (0.0000)
Age ²	-0.000004 (0.0000)	0.000000 (0.0000)	-0.000022 (0.0000)	0.000000 (0.0000)	0.000001 (0.0000)	0.000001 (0.0000)
Exper	-0.000034 (0.0000)	-0.000004 (0.0000)	0.001808 (0.0000)	0.000003 (0.0000)	0.000026 (0.0000)	-0.000068 (0.0000)
1996	0.167660 (0.0005)	0.002411 (0.0001)	-0.053486 (0.0024)	0.009124 (0.0003)	0.019287 (0.0004)	0.011805 (0.0005)
1997	0.165545 (0.0005)	0.002434 (0.0001)	-0.052374 (0.0024)	0.009054 (0.0003)	0.019073 (0.0004)	0.011842 (0.0005)
1998	0.166039 (0.0005)	0.002410 (0.0001)	-0.052292 (0.0024)	0.009254 (0.0003)	0.019146 (0.0004)	0.012237 (0.0005)
1999	0.168091 (0.0005)	0.002428 (0.0001)	-0.052370 (0.0024)	0.009375 (0.0003)	0.019308 (0.0004)	0.013011 (0.0005)
2000	0.166842 (0.0005)	0.002440 (0.0001)	-0.055551 (0.0024)	0.009476 (0.0003)	0.019103 (0.0004)	0.012895 (0.0005)
2001	0.167878 (0.0005)	0.002476 (0.0001)	-0.057390 (0.0024)	0.009227 (0.0003)	0.019699 (0.0004)	0.013296 (0.0005)
2002	0.168497 (0.0005)	0.002513 (0.0001)	-0.058669 (0.0024)	0.009181 (0.0003)	0.020033 (0.0004)	0.012641 (0.0005)
2003	0.169010 (0.0005)	0.002430 (0.0001)	-0.061136 (0.0024)	0.009419 (0.0003)	0.019498 (0.0004)	0.012167 (0.0005)
2004	0.167352 (0.0005)	0.002429 (0.0001)	-0.067439 (0.0024)	0.009048 (0.0003)	0.019183 (0.0004)	0.012333 (0.0005)

Table E5
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2005	0.166794 (0.0005)	0.002418 (0.0001)	-0.074453 (0.0024)	0.009431 (0.0003)	0.020252 (0.0004)	0.012798 (0.0005)
2006	0.165979 (0.0005)	0.002499 (0.0001)	-0.077492 (0.0024)	0.009743 (0.0003)	0.020084 (0.0004)	0.012923 (0.0005)
2007	0.166537 (0.0005)	0.002519 (0.0001)	-0.080174 (0.0024)	0.009526 (0.0003)	0.020648 (0.0004)	0.015651 (0.0005)
2008	0.168190 (0.0005)	0.002475 (0.0001)	-0.088542 (0.0024)	0.009438 (0.0003)	0.021070 (0.0004)	0.022373 (0.0005)
R ²	0.032	0.001	0.208	0.003	0.006	0.007
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes. Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E6
LPMs for Transitions from Construction

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.010878 (0.0000)	-0.000071 (0.0000)	-0.000097 (0.0000)	0.010526 (0.0001)	-0.000282 (0.0000)	-0.000454 (0.0000)
Female	-0.004714 (0.0000)	-0.000426 (0.0000)	-0.001869 (0.0000)	-0.072420 (0.0001)	-0.001459 (0.0000)	-0.001805 (0.0000)
Educ	0.000949 (0.0000)	-0.000204 (0.0000)	-0.000922 (0.0000)	-0.045311 (0.0001)	-0.000852 (0.0000)	-0.000429 (0.0000)
Age	0.000244 (0.0000)	-0.000004 (0.0000)	-0.000054 (0.0000)	-0.000714 (0.0001)	-0.000102 (0.0000)	0.000022 (0.0000)
Age ²	-0.000002 (0.0000)	-0.000000 (0.0000)	0.000000 (0.0000)	0.000003 (0.0000)	0.000001 (0.0000)	-0.000001 (0.0000)
Exper	-0.000047 (0.0000)	-0.000007 (0.0000)	-0.000017 (0.0000)	0.000061 (0.0000)	-0.000002 (0.0000)	-0.000025 (0.0000)
1996	0.054089 (0.0003)	0.001097 (0.0001)	0.005069 (0.0002)	0.063093 (0.0014)	0.006737 (0.0002)	0.005821 (0.0003)
1997	0.053627 (0.0003)	0.001118 (0.0001)	0.005194 (0.0002)	0.064378 (0.0014)	0.006668 (0.0002)	0.005015 (0.0003)
1998	0.054202 (0.0003)	0.001109 (0.0001)	0.005276 (0.0002)	0.065607 (0.0014)	0.006673 (0.0002)	0.005037 (0.0003)
1999	0.054321 (0.0003)	0.001147 (0.0001)	0.005189 (0.0002)	0.067217 (0.0014)	0.006736 (0.0002)	0.004969 (0.0003)
2000	0.054176 (0.0003)	0.001142 (0.0001)	0.005276 (0.0002)	0.068725 (0.0014)	0.006734 (0.0002)	0.005086 (0.0003)
2001	0.054719 (0.0003)	0.001220 (0.0001)	0.005505 (0.0002)	0.069782 (0.0014)	0.006865 (0.0002)	0.005454 (0.0003)
2002	0.055284 (0.0003)	0.001542 (0.0001)	0.005462 (0.0002)	0.069856 (0.0014)	0.006928 (0.0002)	0.005431 (0.0003)
2003	0.054899 (0.0003)	0.001177 (0.0001)	0.005169 (0.0002)	0.070189 (0.0014)	0.006895 (0.0002)	0.005386 (0.0003)
2004	0.054343 (0.0003)	0.001171 (0.0001)	0.005150 (0.0002)	0.071047 (0.0014)	0.006734 (0.0002)	0.005584 (0.0003)
2005	0.054113 (0.0003)	0.001170 (0.0001)	0.005108 (0.0002)	0.072836 (0.0014)	0.007054 (0.0002)	0.005382 (0.0003)

Table E6
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2006	0.054103 (0.0003)	0.001236 (0.0001)	0.005391 (0.0002)	0.075271 (0.0014)	0.007115 (0.0002)	0.005539 (0.0003)
2007	0.054639 (0.0003)	0.001247 (0.0001)	0.005680 (0.0002)	0.076364 (0.0014)	0.007490 (0.0002)	0.006183 (0.0003)
2008	0.055524 (0.0003)	0.001244 (0.0001)	0.005606 (0.0002)	0.075061 (0.0014)	0.007279 (0.0002)	0.006376 (0.0003)
R ²	0.012	0.001	0.002	0.089	0.002	0.002
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes. Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E7
LPMs for Transitions from Trade/Utilities/Transportation/Communication

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.026987 (0.0000)	-0.000184 (0.0000)	0.000634 (0.0000)	-0.000375 (0.0000)	0.063507 (0.0002)	0.000844 (0.0001)
Female	-0.005852 (0.0000)	-0.000326 (0.0000)	-0.002861 (0.0000)	-0.001572 (0.0000)	-0.067344 (0.0002)	-0.000483 (0.0000)
Educ	0.002892 (0.0000)	-0.000210 (0.0000)	-0.002559 (0.0000)	-0.000951 (0.0000)	-0.141734 (0.0002)	-0.001605 (0.0000)
Age	-0.000112 (0.0000)	-0.000023 (0.0000)	-0.000428 (0.0000)	-0.000114 (0.0000)	-0.012223 (0.0001)	-0.000767 (0.0000)
Age ²	0.000002 (0.0000)	0.000000 (0.0000)	0.000002 (0.0000)	0.000001 (0.0000)	0.000096 (0.0000)	0.000006 (0.0000)
Exper	-0.000051 (0.0000)	-0.000006 (0.0000)	0.000000 (0.0000)	0.000007 (0.0000)	0.002761 (0.0000)	-0.000104 (0.0000)
1996	0.147113 (0.0004)	0.002253 (0.0001)	0.016431 (0.0004)	0.007371 (0.0002)	0.216253 (0.0024)	0.023695 (0.0005)
1997	0.146747 (0.0004)	0.002167 (0.0001)	0.016563 (0.0004)	0.007473 (0.0002)	0.218095 (0.0024)	0.024085 (0.0005)
1998	0.147328 (0.0004)	0.002182 (0.0001)	0.017010 (0.0004)	0.007763 (0.0002)	0.218279 (0.0024)	0.024444 (0.0005)
1999	0.147673 (0.0004)	0.002227 (0.0001)	0.016710 (0.0004)	0.007701 (0.0002)	0.220733 (0.0024)	0.025032 (0.0005)
2000	0.148130 (0.0004)	0.002307 (0.0001)	0.018071 (0.0004)	0.007919 (0.0002)	0.219343 (0.0024)	0.026236 (0.0005)
2001	0.148703 (0.0004)	0.002251 (0.0001)	0.017521 (0.0004)	0.007984 (0.0002)	0.216655 (0.0024)	0.026301 (0.0005)
2002	0.148871 (0.0004)	0.002242 (0.0001)	0.017136 (0.0004)	0.007820 (0.0002)	0.216250 (0.0024)	0.025882 (0.0005)
2003	0.149120 (0.0004)	0.002234 (0.0001)	0.016383 (0.0004)	0.007599 (0.0002)	0.219104 (0.0024)	0.025107 (0.0005)
2004	0.148561 (0.0004)	0.002247 (0.0001)	0.016455 (0.0004)	0.007689 (0.0002)	0.220295 (0.0024)	0.025805 (0.0005)

Table E7
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2005	0.148485 (0.0004)	0.002287 (0.0001)	0.017015 (0.0004)	0.008001 (0.0002)	0.219245 (0.0024)	0.025834 (0.0005)
2006	0.148240 (0.0004)	0.002332 (0.0001)	0.018177 (0.0004)	0.008463 (0.0002)	0.218487 (0.0025)	0.028327 (0.0005)
2007	0.148305 (0.0004)	0.002379 (0.0001)	0.018963 (0.0004)	0.008249 (0.0002)	0.218198 (0.0025)	0.029273 (0.0005)
2008	0.148969 (0.0004)	0.002323 (0.0001)	0.018179 (0.0004)	0.007977 (0.0002)	0.220788 (0.0025)	0.029695 (0.0005)
R ²	0.027	0.000	0.006	0.002	0.219	0.008
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes: Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

Table E8
LPMs for Transitions from Services

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
Log wage	-0.053865 (0.0001)	-0.000495 (0.0000)	0.001175 (0.0000)	-0.000427 (0.0000)	0.001082 (0.0000)	0.115213 (0.0003)
Female	-0.005405 (0.0000)	-0.000290 (0.0000)	-0.000460 (0.0000)	-0.001407 (0.0000)	-0.000435 (0.0000)	0.311815 (0.0002)
Educ	0.010835 (0.0000)	-0.000079 (0.0000)	0.000068 (0.0000)	-0.000487 (0.0000)	-0.001275 (0.0000)	0.297115 (0.0002)
Age	0.000914 (0.0000)	0.000032 (0.0000)	-0.000299 (0.0000)	-0.000033 (0.0000)	-0.000663 (0.0000)	0.013238 (0.0001)
Age ²	-0.000006 (0.0000)	-0.000000 (0.0000)	0.000002 (0.0000)	0.000000 (0.0000)	0.000006 (0.0000)	-0.000100 (0.0000)
Exper	-0.000483 (0.0000)	-0.000016 (0.0000)	-0.000122 (0.0000)	-0.000022 (0.0000)	-0.000132 (0.0000)	0.001245 (0.0000)
1996	0.266783 (0.0006)	0.002493 (0.0001)	0.008159 (0.0004)	0.005890 (0.0002)	0.019991 (0.0005)	-0.762166 (0.0029)
1997	0.265513 (0.0006)	0.002509 (0.0001)	0.008397 (0.0004)	0.005651 (0.0002)	0.019542 (0.0005)	-0.757077 (0.0029)
1998	0.265447 (0.0006)	0.002570 (0.0001)	0.008802 (0.0004)	0.005848 (0.0002)	0.020184 (0.0005)	-0.758776 (0.0029)
1999	0.265631 (0.0006)	0.002542 (0.0001)	0.008537 (0.0004)	0.005815 (0.0002)	0.020672 (0.0005)	-0.755482 (0.0029)
2000	0.266831 (0.0006)	0.002620 (0.0001)	0.009355 (0.0004)	0.006153 (0.0002)	0.020795 (0.0005)	-0.757827 (0.0029)
2001	0.267134 (0.0006)	0.002606 (0.0001)	0.009438 (0.0004)	0.005987 (0.0002)	0.020710 (0.0005)	-0.758742 (0.0029)
2002	0.268872 (0.0006)	0.002675 (0.0001)	0.008862 (0.0004)	0.006075 (0.0002)	0.020793 (0.0005)	-0.755557 (0.0029)
2003	0.269430 (0.0006)	0.002566 (0.0001)	0.008300 (0.0004)	0.005827 (0.0002)	0.021003 (0.0005)	-0.755543 (0.0029)
2004	0.267912 (0.0006)	0.002570 (0.0001)	0.008082 (0.0004)	0.005990 (0.0002)	0.020442 (0.0005)	-0.756521 (0.0029)
2005	0.268659 (0.0006)	0.002607 (0.0001)	0.008610 (0.0004)	0.006332 (0.0002)	0.021444 (0.0005)	-0.757557 (0.0029)

Table E8
(Continued)

	Unemployment	Agriculture/ mining	Manufacturing	Construction	Trade/utilities/ transportation/ communication	Services
2006	0.268108 (0.0006)	0.002678 (0.0001)	0.009466 (0.0004)	0.006560 (0.0002)	0.022496 (0.0005)	-0.757989 (0.0029)
2007	0.267986 (0.0006)	0.003301 (0.0001)	0.011265 (0.0004)	0.007037 (0.0002)	0.024201 (0.0005)	-0.761959 (0.0029)
2008	0.267730 (0.0006)	0.003141 (0.0001)	0.011394 (0.0004)	0.006458 (0.0002)	0.024305 (0.0005)	-0.758265 (0.0029)
R ²	0.055	0.001	0.005	0.002	0.007	0.586
Observations	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918	20,373,918

Notes: Standard errors in parentheses. Sectors: (0) unemployment; (1) agriculture/mining; (2) manufacturing; (3) construction; (4) trade/utilities/transportation/communication; (5) services.

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