Payroll Taxes, Firm Behavior, Rent Sharing: Evidence from a Young Workers Tax Cut

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Motivation

Payroll taxes are a large component of OECD labor tax wedges

Cuts to payroll taxes discussed as way to reduce labor costs

Real world view:

Pros: Boosts employment and business activity
Cons: Giveaway to firm owners

Public economists’ view:

Incidence falls on workers’ wages ⇒ No labor cost reduction
⇒ Small labor supply employment effects

We study a large, long-lasting employer payroll tax cut in Sweden for workers aged ≤ 26, tax rate cut from 31% down to 15%
Main Findings

A. **Worker-level diff-in-diff** contradicts canonical PF prediction:
   - Zero wage incidence (and hence full labor cost reduction)
   - Sizable employment effects
     Concentrated in high youth unemployment areas
     Due to lower separation rates

B. **Firms responses:**
   Firms with more young workers expand and raise wages for both young and old workers, and more so for low earners
   ⇒ “Collective” incidence on workers, perhaps via rent-sharing
Related Literature

**Work on our tax reform, on which we build:**
Market-level analysis (DiD individual regression approach):

Firm/industry perspective:

**Firms & tax incentives:**
No (real) firm-level responses to 2003 dividend tax cut. (Yagan 2017)
Firms did respond to investment subsidy during Great Recession. (Zwick 2017)
French short-term hiring subsidies for the unemployed were effective during Great Recession. (Cahuc, Carcillo and Le Barbanchon 2016)

**Payroll tax incidence** (market-level):

Outline

1. Institutional setting & data

2. Worker-level results
   (a) Wage incidence
   (b) Employment

3. Firm-level results
   (a) Employment and other business outcomes
   (b) Wage spillovers
1 - Institutional Setting
Our Setting

Pre-reform setting:
Payroll tax rate: 31.42%. Linear, no cap, no differentiation.

Nominally paid fully by employer.
The Payroll Tax Cut
The Payroll Tax Cut

Year

Ages <= 26

Ages >26

January 1 2009

January 1 2009

0

15.5%

32.4%
The Payroll Tax Cut

Payroll tax rate (in percent)

Year

Low rate for young workers
Normal tax rate

July 1 2007
January 1 2009
The payroll tax cut: Key features

Motivation: Fight high youth unemployment

First debated on October 2006 after right-wing coalition victory

Encompassing: both new hires and incumbent workers treated

No effects on social insurance benefits (pure tax cut)

Eligibility determined by cohort (not exact age):
Eligible if turning age 26 or less during calendar year for 2009+
(and 25 or less from July 1st, 2007 to end of 2008)

Perceived to be permanent

Close to perfect take-up given simple software administration
Data Sources

1) **Individuals:**

   - Demographic information (age, gender, education), 1990-2013.
     (LISA; univ.)

     (RAMS; univ.)

   - Wage and hours survey, 1995-2013.
     (Structure of Earnings Survey; 50%)

2) **Later: Firms:**

     (FK data; univ.)

Source: Statistics Sweden.
Wage Measures

Statistics Sweden collects data on wages and hours worked through annual survey covering 100% of public sector workers and 50% of private sector worker.

Stratified random sampling of firms (100% of firms with 500+ workers)

≥ 97% response rate in private sector.

Captures information for 1 month (typically September, October, or November)

Our focus:
Mean monthly real wages and labor cost by age groups at different periods (CPI deflated; converted to USD) [we get similar results with median; or with tax-reported actual annual earnings].
1. Institutional setting & data

2. Worker-level results
   (a) Wage incidence
   (b) Employment

3. Firm-level results
   (a) Employment and other business outcomes
   (b) Wage spillovers
2 - Worker-Level Results

Wages
Wage Incidence

Cf. Egebark & Kaunitz (2014)
Cf. Skedinger (2014)
### Wage Incidence

**Monthly wage (USD)**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>20</td>
<td></td>
<td>1800</td>
<td>2200</td>
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<td>2000</td>
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<td>3400</td>
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<td>29</td>
<td></td>
<td>3600</td>
<td>4000</td>
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<td></td>
<td>3800</td>
<td>4200</td>
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<td>31</td>
<td></td>
<td>4000</td>
<td>4400</td>
</tr>
<tr>
<td>32</td>
<td></td>
<td>4200</td>
<td>4600</td>
</tr>
</tbody>
</table>

- **Full-incidence benchmark:**
- **Age:**
- **Monthly wage (USD):**
Labor Costs \( (1 + \tau_{y,\text{age}}) \cdot w_{y,\text{age}} \)
Wage Incidence (monthly cohorts)
Interpretation: Wages are constrained by CBAs

Collective bargaining agreements (CBAs) important in wage setting ($\approx 90\%$ covered).

- CBAs define rules for wage negotiations.

36\%: bilateral employer-employee negotiations

57\%: firm-level labor cost determined centrally, but bargaining over allocation.

7\%: centrally determined wages (incl. those at minimum wage).

- CBAs define wage floors.

Agreements define wage floor by occupation and industry [and sometimes by age].

If wage floor above market clearing wage then payroll tax cut might not raise wage.
Top 20% of the Wage Distribution

Monthly wage (USD) vs Age for different periods:
- 2002−2004
- 2005−2006
- 2009−2011
- 2012−2013

Graph showing trends in monthly wages for different age groups over the specified periods.
Monthly gross wage

Ages: 22–24, 2009–2013
Wages in New Jobs Only

(Subsample: E-E & U-E transitions)
Labor Costs \((1 + \tau_{y,\text{age}}) \cdot w_{y,\text{age}}\)
1. Institutional setting & data

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   (b) Wage spillovers
2 - Worker-Level Results
Employment
Employment Outcomes

Admin. pop. data on labor market biographies & demographics:

\[
\text{EmploymentRate}_{y,\text{age}} = \frac{\#\text{Employed}_{y,\text{age}}}{\#\text{LaborForce}_{y,\text{age}}}
= \frac{\#\text{Employed}_{y,\text{age}}}{\#\text{Employed}_{y,\text{age}} + \#\text{Unemployed}_{y,\text{age}}}
\]

Unemployed: Not employed & registered as unemployed 1+ days during year.

Employed: Hold job with nontrivial annual earnings ($4.5K+).

Results are robust to changing either threshold.
Employment Effects

![Graph showing employment/labor force trends across ages from 2002-2004 and 2005-2006.]
Employment Effects

Appendix: LFP
Cf.: E&K (2014)
Employment Effects by Age

DD-estimate: 0.021 (0.003)
Adding Students to the Labor Force

![Graph showing the share of labor force in employment across different age groups from 2002-2004 to 2012-2013. The graph highlights changes before and after the 2007 reform and the significant increase in participation after 2009.](image-url)
## Effect of Payroll Tax Cut on Employment Measures

<table>
<thead>
<tr>
<th></th>
<th>(1) Effect (perc. points)</th>
<th>(2) Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment / Labor Force (LF)</td>
<td>0.021</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>(0.0026)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Employment / (LF+students)</td>
<td>0.023</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>(0.0040)</td>
<td>(0.047)</td>
</tr>
<tr>
<td>Employment / Population</td>
<td>0.014</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>(0.0039)</td>
<td>(0.066)</td>
</tr>
<tr>
<td>Labor force / Population</td>
<td>-0.0096</td>
<td>-0.11</td>
</tr>
<tr>
<td></td>
<td>(0.0034)</td>
<td>(0.038)</td>
</tr>
</tbody>
</table>

| N | 64 | 64 |

Notes: DD estimates based on OLS regression using the aggregated times series by age and time periods displayed in the figures.
Varying the earnings threshold to define employment
Regional Variation in 2006 Youth Unemployment

Q5: 20 – 23.3%
Q4: 17.8 – 20%
Q3: 14.9 – 17.8%
Q2: 12.4 – 14.9%
Q1: 10.5 – 12.4%
Regional Effects by 2006 Youth Unemployment

Age

Employment / Labor force

2005-2006, Low youth unem.
Regional Effects by 2006 Youth Unemployment

Employment / Labor force

Age

2005-2006, Low youth unem.

2012-2013, Low
Regional Effects by 2006 Youth Unemployment

Employment / Labor force

Age

2005-2006, Low youth unem.
2012-2013, Low
2005-2006, High
DD Regional Effects by 2006 Youth Unemployment

Local youth unemployment rate in 2006 (quintiles)

Employment / LF effect
Regional \textbf{Wage} Effects by 2006 Youth Unemp.
Employment Effects by Age

DD-estimate: .021 (.003)
Employment Effects: Worker Transition Rates

Unemployment-Employment
DD-estimate: 0.04 (0.012)

Employment-Unemployment
DD-estimate: -0.215 (0.032)

Age

Log Hirings

Log Separations

Unemployment-Employment
DD-estimate: 0.04 (0.012)

Employment-Unemployment
DD-estimate: -0.215 (0.032)
Worker-Level Findings

Worker-level results **contradict** canonical PF incidence predictions:

- **Zero** wage incidence,
- **Full** labor cost reduction,
- **Large** employment effects.
  
  Concentrated in high-unemployment areas.

⇒ **Payroll tax cut is a business tax cut:** Do firms use payroll tax cut to expand business? Or do firms “pocket” the tax windfall?

(And, how else does payroll tax incidence then work, if not through market equilibrium?)

Reform generates second, **firm-level** experiment:

Longitudinal analysis based on firm’s **pre-reform share of young workers**.
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   (a) Wage incidence
   (b) Employment

3. Firm-level results
   (a) Employment and other business outcomes
   (b) Wage spillovers
2 - Firm-Level Results

Scale Outcomes
Firm Data

Merged data:
- Our micro worker data from part A
- Firm-level income statements and balance sheets (FK data, Statistics Sweden)

Sample:
- Private-sector, domestic firms
- > 3 employees.
- Balanced panel 2003–2013
Firm Heterogeneity in Exposure: \[ \frac{Treated \ Wage \ Bill_{f,2006}}{Total \ Wage \ Bill_{f,2006}} \]
Firm Heterogeneity in Exposure: \( \frac{Treated \; Wage \; Bill_{f,2006}}{Total \; Wage \; Bill_{f,2006}} \)

- No young + bottom 1/4: Mean = 0.01
- Low share young
- Middle 1/2: Mean = 0.125
- Medium share young
- Top 1/4: Mean = 0.323
- High share young

Density

Fraction of payroll to young, 2006
Firm Heterogeneity in Exposure: $\frac{Treated \ Wage\ Bill_{f,2006}}{Total\ Wage\ Bill_{f,2006}}$

- No young + bottom 1/4
  - Mean: .01
  - Low share young

- Middle 1/2
  - Mean: .125
  - Medium share young

- Second 1/8
  - Mean: .25
  - Fairly high share young

- Top 1/8
  - Mean: .396
  - Very high share young

Fraction of payroll to young, 2006

Density

0 .1 .2 .3 .4 .5 .6 .7 .8
Payroll Share of Treatment-Age Workers, by 2006 Share

Year

Share of payroll to young workers

High share young
Medium share young
Low share young
Payroll Share of Treatment-Age Workers, by 2006 Share
## Firm Descriptives in 2006

<table>
<thead>
<tr>
<th>Share young:</th>
<th>Low No young + bottom 1/4</th>
<th>Medium Middle 1/2</th>
<th>High Top 1/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction young</td>
<td>0.01</td>
<td>0.13</td>
<td>0.32</td>
</tr>
<tr>
<td>Full-time employees</td>
<td>9.46</td>
<td>14.06</td>
<td>13.46</td>
</tr>
<tr>
<td>Employee cost (incl. payroll tax)</td>
<td>35.23</td>
<td>31.46</td>
<td>27.99</td>
</tr>
<tr>
<td>Value added</td>
<td>701.27</td>
<td>887.57</td>
<td>743.94</td>
</tr>
<tr>
<td>Sales</td>
<td>1249.69</td>
<td>1827.04</td>
<td>1821.04</td>
</tr>
<tr>
<td>Operating profit</td>
<td>68.73</td>
<td>83.79</td>
<td>66.13</td>
</tr>
</tbody>
</table>

**Financial constraints**

| FC: below median liquid assets / TA             | 0.47                      | 0.53              | 0.50        |
| Financial constraints                          | FC: below median sales    | 0.58              | 0.42        | 0.49        |
| FC: below median firm age                       | 0.45                      | 0.46              | 0.55        |

**Industries**

| Agriculture and mining                         | 0.04                      | 0.05              | 0.07        |
| Manufacturing                                  | 0.19                      | 0.18              | 0.11        |
| Construction                                   | 0.15                      | 0.21              | 0.16        |
| Wholesale and retail                           | 0.23                      | 0.27              | 0.34        |
| Hotel and restaurants                          | 0.02                      | 0.05              | 0.13        |
| Transport and communication                    | 0.11                      | 0.11              | 0.07        |
| Property management, B2B                       | 0.16                      | 0.08              | 0.06        |
| Education                                      | 0.02                      | 0.02              | 0.01        |
| Healthcare (not pharmaceutic firms)            | 0.05                      | 0.02              | 0.00        |
| Public services                                | 0.02                      | 0.03              | 0.05        |

| Observations                                   | 5698                      | 5265              | 2632        |
Firm-Level Employment

Firm-level employment: firm $f$, year $y$

\[
\frac{\text{Employees}_{f,y}}{\text{Employees}_{f,2006}}
\]

Plot time series of unweighted average for each group

Definition: Full-time-equivalent workers, i.e. annual earnings above (small) earnings index provided by social insurance benchmark ($> $4.5K in 2013)

Results are robust to changing threshold and considering cumulative wage bill instead of bodies
Firm-Level Employment: \( \frac{\text{Emp}_{f,t}}{\text{Emp}_{f,2006}} \)

Year

High share young
Medium share young

Workers relative to 2006
Dose Treatment: Splitting the Top-Group in Two

Year

Workers relative to 2006

Very high share
Fairly high share
Medium share

Other Firm Outcomes

1) Employment ✓

2) Capital (assets)

3) Sales

4) Value added

5) Profits

Then: wages, rent sharing.
Value Added

![Graph showing value added relative to 2006 for high share young and medium share young over the years from 2003 to 2013.](image-url)
## Effect of Payroll Tax Cut on Firm Outcomes

<table>
<thead>
<tr>
<th></th>
<th>(1) Benchmark: high vs. medium share young</th>
<th>(2) Fairly high vs. medium share young</th>
<th>(3) Very high vs. medium share young</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Workers</td>
<td>0.046</td>
<td>0.028</td>
<td>0.065</td>
</tr>
<tr>
<td></td>
<td>(0.0034)</td>
<td>(0.0034)</td>
<td>(0.0043)</td>
</tr>
<tr>
<td>Total assets</td>
<td>0.058</td>
<td>0.039</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.015)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Sales</td>
<td>0.031</td>
<td>0.021</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>(0.0041)</td>
<td>(0.0029)</td>
<td>(0.0064)</td>
</tr>
<tr>
<td>Value Added</td>
<td>0.061</td>
<td>0.040</td>
<td>0.082</td>
</tr>
<tr>
<td></td>
<td>(0.0073)</td>
<td>(0.0072)</td>
<td>(0.0081)</td>
</tr>
<tr>
<td>Profits (EBIT)</td>
<td>0.081</td>
<td>0.046</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.019)</td>
<td>(0.019)</td>
</tr>
</tbody>
</table>

Notes: DD estimates based on OLS regression using the aggregated times series by year and groups displayed in the figures.
Robustness: Fraction of firms operating (unweighted)
Fraction operating after DFL reweighting by age in 2006

[Graph showing the fraction of young alive from 2003 to 2013 for high share young and medium share young.]
Why Do Businesses Expand?

1) Cash windfall might alleviate credit constraints.

⇒ We split firms by proxies for financial constraints (in 2006)
   (a) age (young firms: more likely constrained)
   (b) liquid assets / total assets (low: more likely constrained)
   (c) sales (size) (low: more likely constrained)

2) Standard scale effect:

   marginal cost of production reduced for firms which can use lots
   of young workers

Our empirical analysis captures the sum of these two effects
Financially constrained in 2006

Firm age below median

Workers relative to 2006

Year

High share young

Medium share young

Firm age below median

Financially constrained in 2006
Effects on Employment by Financial Constraints

- Firm age
- Liquid assets / TA
- Sales

Financially unconstrained in 2006
Constrained
Effects on Total Assets by Financial Constraints

![Bar chart showing effects on total assets relative to 2006 for different financial constraints and ratios such as firm age, liquid assets to total assets (TA), and sales. The chart compares financially unconstrained firms in 2006 vs. constrained firms, with bars representing the effect size and error bars indicating variability.]
2 - Firm-Level Results
Wages & Rent Sharing
Average Wage per Worker: $w$
Average Payroll Tax per Worker $w \cdot \tau$

Payroll tax per worker, rel. to 2006

Year

High share young

Medium share young
Average Labor Cost per Worker: $w \cdot (1 + \tau)$
## Effect of Payroll Tax Cut on Wages per Worker

<table>
<thead>
<tr>
<th></th>
<th>(1) Benchmark: high vs. medium share young</th>
<th>(2) Fairly high vs. medium share young</th>
<th>(3) Very high vs. medium share young</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payroll tax per worker</td>
<td>-0.044</td>
<td>-0.025</td>
<td>-0.063</td>
</tr>
<tr>
<td></td>
<td>(0.0051)</td>
<td>(0.0036)</td>
<td>(0.0068)</td>
</tr>
<tr>
<td>Labor cost per worker</td>
<td>0.0033</td>
<td>0.0035</td>
<td>0.0031</td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
<td>(0.0013)</td>
<td>(0.0019)</td>
</tr>
<tr>
<td>Average wage per worker</td>
<td>0.019</td>
<td>0.013</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>(0.00082)</td>
<td>(0.0013)</td>
<td>(0.00077)</td>
</tr>
</tbody>
</table>

Notes: DD estimates based on OLS regression using the aggregated times series by year and groups displayed in the figures.
Individual-Level Wages

Average wage dynamics may be confounded by composition shifts.

⇒ Follow cohort of individuals based on their 2006 firm.

Sample: untreated workers aged 25-60 in 2006 (to have pre-trends and uncover spillovers)

Details:

DFL-reweight wage series to keep 2006 cohort’s age composition constant within firm groups (5-year age groups 25-29, 30-35, ...). Allow for firm mobility.
Dose Treatment: Splitting the Top Group in Two

Year
1999 2001 2003 2005 2007 2009 2011 2013

Earnings relative to 2006

Very high share
Relatively high share
Medium share young

Line graphs for Very high share, Relatively high share, and Medium share young.
Individual vs. Collective Tax Incidence on Labor

Standard frictionless benchmark predicts 100% incidence on directly affected worker beneficiary group.

Our evidence shows that workers benefit from the payroll tax cut – but collectively in specific firms, not only the treated workers.

Hence, at the macro level, our evidence is consistent with part of the incidence falling on workers – young and old workers in the “treated firms”.

⇒ Possible that insensitivity of labor income share to payroll taxation is due more to rent sharing than Cobb-Douglas production function.
Who Benefits from Collective Tax Incidence?

Rent sharing / bargaining?

⇒ We split workers by earnings level:

- **Within firms:** Workers below vs. above median
- **By percentiles:** We look at effects on wage earnings percentiles (instead of firms)

Alternative mechanism: production complementarities
Earnings: Below Firm Median in 2006
Earnings: Above Firm Median in 2006


Earnings relative to 2006:
- High share young
- Medium share young

Graph showing the earnings relative to 2006 for high and medium share young from 1999 to 2013.
Earnings Growth: P-80

Year
1999 2001 2003 2005 2007 2009 2011 2013

Earnings relative to 2006
High share young
Medium share young
Earnings Effects Across various Percentiles

Appendix: Pre-Trends

Effect on earnings relative to 2006

Earnings percentile

Effect on earnings relative to 2006

Earnings percentile
Earnings Effects Across the Distribution

![Graph showing earnings effects across the distribution. The graph plots the effect on earnings relative to 2006 against earnings percentile. The x-axis represents earnings percentile, ranging from 20 to 90. The y-axis represents the effect on earnings relative to 2006, ranging from -0.025 to 0.075. The graph includes a line for Placebo-reform in 2003.](image-url)
The Transmission of Payroll Tax Incidence

**Standard view:** Payroll tax split between market-level wage of directly treated workers and employers’ profits.

**Our findings:** Transmission of payroll tax wage incidence may work through firm-level rent-sharing.

⇒ “Collective” incidence on all workers’ wages – incl. “untreated” ones.
⇒ Less of a “give-away” to firm owners than aggregate evidence suggests.

Rent-sharing is consistent with “macro incidence” falling on workers’ wages.

Related evidence:

Rent sharing and “firm fixed effects”.

Wage-setting norms may shield targeted workers from incidence.

(Bewley 1999)
Which Model is Consistent with Our Results?

**Neo-classical model with wage equity constraint:**

Standard model with young (Y) vs. old (O) labor inputs

If in equilibrium $w_Y < w_O$, then wage equity constraint $\Rightarrow$ Classical unemployment among young

Young payroll tax cut alleviates constraint, no incidence on wages, and reduction in unemployment

With 2 types of firms, firms hiring mostly young workers will expand production, hire more, and pay higher wages on all their workers

Targeted employer payroll tax cuts are the ideal tool to restore efficiency

Neo-classical model is parsimonious but does not have rent sharing and hence is likely unrealistic
Conclusion

A. The payroll tax cut “worked”:

   Clear zero effect on market wages

   ⇒ Full reduction in labor costs (12%)

   ⇒ Sizable reduction in youth unemployment: 2.2ppt

   Concentrated in high-unemployment areas
   Due to lower separation rates

B. Firm-level responses were crucial in incidence:

   Targeted firms actively respond to stimulus, expanding along all dimensions

   “Collective incidence” on wages through rent-sharing: Firms raise wages for all workers (more so for low-paid workers)
Previous Work on this payroll tax cut


LF consists of employed (above one basis threshold) and unemployed
New hires in 2000: Job length by age
STANDARD TAX INCIDENCE FRAMEWORK

Labor supply and labor demand at the **market level** define wage rate and labor. (Individual firms are irrelevant.)

Share of payroll tax incidence on workers’ take-home wage is given by $|\varepsilon_D|/(\varepsilon_S + |\varepsilon_D|)$.

$\varepsilon_D, \varepsilon_S$: Labor Demand and Supply elasticities.

Received wisdom is that $|\varepsilon_D| >> \varepsilon_S$ economy-wide $\Rightarrow$ incidence **mostly** on workers [Hamermesh ’93 survey $|\varepsilon_D| \simeq 0.5$]

In our context: Targeted young workers’ labor very close substitute to slightly older workers’

$\Rightarrow |\varepsilon_D| \to \infty$ at the age discontinuity.

$\Rightarrow$ **Wage incidence fully on young workers regardless of $\varepsilon_S$.**

$\Rightarrow$ **Employment** response largely driven by $\varepsilon_S$. **Small.**
Definitions and measurement of the labor force

• **Employed:**
  - **Official statistics (ILO standard), based on interview during reference week:**
    Employed; self-employed; absent due to parental leave/vacation
  - **Microdata:**
    Annual labor or self-employment earnings above official cutoff of USD 5,500 (in 2013).

• **Unemployed:**
  - **Official statistics (ILO standard):**
    Idle individuals who have applied for a job during past 4 weeks and is able to start immediately.
  - **Microdata:**
    Have registered with UI office sometime during the year (and is not employed).

• Potential caveats: Students applying for work; idle job-seekers who do not register with UI office
Comparison of employment rate

![Graph showing comparison of employment rate from 2005 to 2012. The graph compares official statistics and microdata. The trend shows a slight increase in employment rate from 2005 to 2012.]
Comparison of unemployment rate